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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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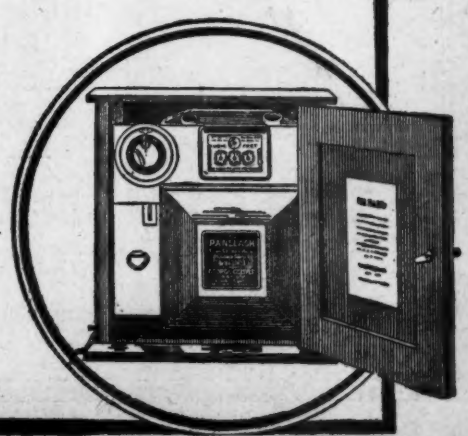

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VOL. CLXVI., No. 3187.] WEDNESDAY, JUNE 11, 1924. [76TH YEAR.

EDITORIAL NOTES.

The Institution Programme.

THE programme for the annual meeting of the Institution of Gas Engineers has been received from the Secretary (Mr. Walter T. Dunn). A statement of this kind, indicating the order of proceedings and the headings of matters which will engage members at the meeting and elsewhere, does not as a rule reveal very much as to the quality and interest that lies ahead. But on this occasion sufficient is known to enable us to say that the proceedings at the Institution of Electrical Engineers, under the presidency of Mr. Samuel Tagg, M.Inst.C.E., of Preston, the social functions, and the visits to Paris and Wembley, will severally and collectively result in the highest satisfaction and pleasure to all who take part in them. The programme is reproduced practically *in extenso* in later columns, together with the major part of the report of the Council.

As the programme for the meeting is perused, it is interesting to observe that the subjects which will be brought under consideration are all of current importance in relation to matters which aim at higher thermal, life, and working efficiencies in the plants, processes, and gas-consuming appliances of the industry. On this occasion the papers are commendably few, which will be an advantage to free discussion. The technical reports, however, exceed them in number, and will in the aggregate be found somewhat extensive; but they will not be burdensome, owing to the excellent practice of those responsible for them presenting at the meeting an epitome of their contents and conclusions. Arrangements have been made for a good distribution of the subject-matter which has been prepared, by the holding of afternoon sessions on Tuesday and Wednesday, though, after a morning session, an afternoon one is not generally very popular. But on both afternoons there will be matters for discussion of large importance to the technical men of the industry. The President may be relied upon, in his address, for presenting the members with questions for consideration of significance in connection with the current position and policy of the industry. Mr. Tagg never speaks publicly without having given full thought to what he has to say; thence our confidence in predicting that what we shall hear from him on the morning of June 24 will be something which will set us all thinking—at any rate, it is bound to be something which, in the interests of the industry, it will be to our advantage to hear and to deliberate over. The Gas Investigation Committee will be prominent with three reports—dealing with "Aeration in Atmospheric Burners," "Waste-Heat Boilers Attached to Continuous Vertical Retorts," and "Standard Methods of Testing Gas-Cookers." These are all topics of particular importance to the development of our industrial efficiencies and economies. No less so will be the report of the Refractory Materials Joint Research Committee, which will be introduced by Mr. J. P. Leather. There is no intention on this occasion to present a report of small proportions, and rather barren in research results; for, by permission of the Department of Scientific and Industrial Research, a number of notes, which have been presented to the British Refractory Research Association, are included. A further report will be by Dr. Stuart Pexton (late Institution Gas Research Fellow) and Prof. John W. Cobb on the "Gasification of Coke in Steam with Special Reference to the Rates of Gasification and Composition of Gas Produced."

Regarding the papers, the members are to be given, by Mr. A. G. Lane, the opportunity of discussing "The Regenerative Coal Gasification System at Aylesbury." There will be a large amount of interest in this, as the system has—through the articles that appeared in the "JOURNAL" for Oct. 3 and 10 last year—struck many gas engineers as containing novelty and good effect for their consideration in connection with gas production. It will add greatly to the interest of this paper to have present the inventors—Dr. Morris W. Travers, F.R.S., and Mr. F. W. Clark—who have promised to open the discussion. As technical workers for advance in the gas field, they will be heartily welcomed. The subject is one in which they have been living for a long time; and they were determined that they would not say much about it until they could speak confidently as to results. This they were able to do in the joint contribution to our columns in the autumn of last year. Preceding the report of the Refractory Materials Joint Research Committee, will be a paper by Mr. W. Emery, of Stoke-on-Trent, on "Silica Gas-Retorts;" and this and the report will be discussed together. The final paper will be by Mr. R. E. Gibson, of Liverpool, on "The Construction of New Coal-Gas Works at Garston." Thus it is seen there will be before the meeting a good variety of technical fare, and as much as the members will be able to digest and discuss in the time at disposal. In fact, it is doubtful whether they will be able to digest it in the time; but it will all be on record in the special issue of the "JOURNAL."

Considerable satisfaction will be manifested by the members in the choice of Mr. Stephen Lacey, B.Sc., as the recipient of the Institution's Gold Medal, for his paper (submitted at the Belfast meeting) on the "Flow of Gas in Pipes." There are on the agenda a few strange items which tell of development, and in one respect—the educational—of vital importance to the future technical personnel of the industry. "Presentation of Diplomas in Gas Engineering awarded under the Institution's Educational Scheme" is one item. Readers will have seen in the "JOURNAL" last week [p. 666] that of seven candidates for this, the highest certification the industry has to offer, two were successful—Mr. P. C. Gardiner, of Tottenham, and Mr. J. Hood, of Shrewsbury. The roll of winners will with time be greatly extended; but the bearers of these two names will always have the honour of standing initially in the list, however long it grows. Then the report of the Advisory Committee on Education is to be presented by the Chairman (Mr. F. W. Goodenough). Another new item, emphasized by heavy type in the agenda, is "Presentation of Presidential Certificate."

There is in all this good promise of a highly beneficial and interesting meeting, from which there will be at other times relaxation in a reception and dance by invitation of the President and Mrs. Tagg, and in other more private events. Then will come the division of those attending the meeting—some will journey to Paris on the Thursday afternoon to take part in the celebrations there of the French gas industry, while others of the large gathering will remain in London and visit on Friday the British Empire Exhibition and their own demonstration in it.

In Paris.

THERE will be an especial pleasure to those who are able to visit Paris to join hands with their French colleagues, and to congratulate them on the position of the gas industry in their country as the result of a century's development. There will also be unbounded satisfaction on the part of the visitors to felicitate the President, office-bearers, and members of the Société Technique du Gaz upon their Jubilee. We have in Great Britain had our Centenary of gas supply,

and our own Institution Jubilee; and during the celebration of both events, the warmest of congratulations and good wishes were expressed by our French colleagues. The opportunity has arrived for reciprocation; and we shall try to equal—it would be idle to hope to excel—the cordiality and sound ring of their expressions of pleasure and hopes for the future. The visitors from Great Britain will go to rejoice with them as neighbours and friends; and they will represent all those other "neighbours and friends" in the gas industry who cannot go, but who know that their feelings will be properly interpreted by their more fortunate colleagues. On the occasion, thoughts will naturally revert to the intense trials and troubles through which the French gas industry passed during the years of terrible war; how many of the technical men of the industry fell in that war; how those who lived to mourn the loss of many comrades set to work, just as valiantly as they fought, to reconstruct the industry's possessions that had been wiped out or ruined by the enemy. It has since been a period of great reconstruction, and of rehabilitating by every possible means the fortunes of the industry. And there has been a full measure of success, which speaks of a great courage, fortitude, and confidence. And confidence in the position and future of the industry is in France as great as it is in this country. "Vive l'Industrie du Gaz en France" will be the toast of every British gas man who goes to Paris a fortnight hence.

Waste of Fuel and Energy.

"Idealism by itself as a working policy is insufficient." These words are quoted from the address by Lord Weir to the Society of British Gas Industries, as published in our columns last week. We have extracted the words for the further consideration of his Lordship, in respect of his highly interesting and instructive deliverance—and "interesting and instructive" are all the addresses, papers, and speeches which come from him. But in this instance he has adopted, as an illustration of waste of fuel and energy, and means of avoidance, a piece of idealism for which, as yet, no practical support has been evolved, and which his Lordship appears to have accepted as valid without applying that vast engineering knowledge of his to ascertain whether upon that ground of idealism a practical structure is possible. It may be that Lord Weir on a critical examination of the illustration and points he makes, would find that he is not far removed, in this respect, from the socialist to whom he refers. This political enthusiast knows, like the rest of us, that there is waste proceeding on a gigantic scale. But "the supreme difficulty is that he rarely appreciates anything other than the waste, or, if he does see the difficulties of its elimination, his suggested methods are clearly provocative of even greater evils and troubles." Perhaps the one means of eliminating waste of fuel and energy which Lord Weir puts forward, and which is to be found in the Coal Conservation Committee's report of 1918, may, if he will give time to an investigation of the matter, prove to be one which would be "provocative of greater evils and troubles" than prevail at present.

Up to a point we agree with him that "our educational system offers wide and ample opportunities for acquiring abstract knowledge of theoretical perfection, but in the practical application our keenness and enthusiasm are blunted by complications caused by past ignorance, lack of vision, and stubborn vested interests." Much that has happened in connection with this question of waste of fuel and energy has been due to ignorance and lack of vision. But the knowledge that has displaced that ignorance exists among scientific and technical men, and not among the politicians who happen still to be lords of the position. But we do not altogether blame them for the happenings of the past. Knowledge of these questions has been a matter of comparatively slow evolution; and where knowledge did not exist, constructive legislation could not obtain of the order which we know would be in the national interests if, with current knowledge, we were starting *de novo* to-day. The utilization of fuel and the production of energy are things which, with present knowledge, if systems had not shaped themselves as they have done owing to lack of knowledge, would comply with our ideals and be practicable through a properly co-ordinated system. However, let us see what has happened. Some 112 years ago, the Act was passed which gave birth to public gas supply. There was no knowledge then of gas production, its utilization, and that of the secondary products of coal carbonization, such as exists to-day. The knowledge in our possession now was not ours even 42 years ago, when the first General Act was passed for public electricity supply. The two systems have grown and progressed side by side; but we are conscious that their pronounced individuality is not in the best interests of the country. But who is to be blamed for the lack of vision born of nescience which has been dissipated only since the two industries became deeply rooted and have flourished?

The unfortunate, if now unavoidable, individuality is the acknowledged cause of much waste of fuel and energy. This brings us to the report of the Coal Conservation Committee of 1918. Would their recommendations to-day produce the large economies and efficiencies predicted by them? If they did, would they be obtained without losses in other directions, which would have to be compensated in full from some unknown source if coal is to be saved, and the nation is to benefit? Are their suggestions purely ideal, and, in the stage of development to which we have reached, impracticable? Our own idea is that, as things are, the proposals of the Committee are purely an instance of that "idealism" which "by itself as a working policy is insufficient." But with fine faith, Lord Weir, without adequate investigation, appears to accept as sound and sufficient the conclusions and recommendations of the Committee. If he does not accept them, then he would not have used them for illustrating the point he was making as to the possibilities of a saving in coal, and the generation of cheaper energy. Could we undo the past and amalgamate, in the light of present knowledge, the two industries supplying gas and electricity, things would be far different. We cannot admit that the Committee did deal with the power supply of the kingdom on comprehensive lines, when they omitted to take into consideration the potentialities of a practical combination—not now necessarily financial, but working—of the gas and electricity industries, if such could be found. Where they failed was in dealing with power production and service as being limited to the electricity industry, not taking into account its co-ordination through the instrumentality of other coal-using and energy-producing industries. They predicted that, taking advantage of modern energy development, the saving in coal throughout the country would, in the near future, amount to about 55 million tons per annum on the then existing output of manufactured products. How did they arrive at that substantial sum of coal saving? We assume by taking the fuel consumption of industrial steam plants working below the best attainable efficiency, and calculating the amount of coal that would be saved if they were all operating at the higher efficiency, and the steam produced applied to the generation of electrical energy. This they proposed to do by setting-up super power-stations throughout the country at a prodigious outlay, and distributing the energy through an enormous network of cables, with all the attendant expenditure and energy losses, to compensate for which latter losses coal would have to be used. Has Lord Weir considered what would be the set-off to the saving predicted by the attainment of the ideal conditions? Sometimes "suggested methods are clearly provocative of even greater evils and troubles." That 55 million tons is a vision, which some thought would materialize through the setting-up of Electricity Commissioners and Joint Electricity Authorities, with a large concentration of generation. Not until the Commissioners got to work was the visionary character of the proposals seen; and to-day we are as far as ever from the realization of the saving.

Then Lord Weir quotes the further recommendation of the Committee, "that the sites for the new power stations should provide for the processes involved in the extraction of bye-products from the fuel before it is used for the production of power." There we get near to an indication of the lines along which a really comprehensive inquiry into fuel utilization and energy production should have proceeded. The way of the Committee is not our way. It is the way of perpetuating individuality, and not producing co-ordination, in the use of fuel. Investigation by electrical engineers has shown that carbonizing and bye-product plants attached to electrical generating stations would not be a lucrative or efficient proposition per unit of coal handled. In the first place, there is the heavy capital expenditure, and the running costs of the additional plant, which would require specialists to operate it; there would be no market for the gas other than to gas-works, and the price to them would have to be below (to make purchase

tempting) that of putting home-produced purified gas into the holders in any current circumstances. Then a bye-products plant would involve the super-station in a business which is subject to considerable market value fluctuations, which values would tend to be lowered with increased production. Then as to the saving of coal, its carbonization for the recovery of products before applying the resulting fuel to steam-raising would mean that about 2 tons of coal would have to be handled to produce (according to the carbonizing temperatures employed) between 1 and 1½ tons of coke. Lord Weir might care to inquire whence the saving in coal, or the conservation of our coal resources is to come (even with an 80 p.ct. efficiency in steam-raising) by using fuel from which the secondary products have been extracted by the producers of electrical energy. Without employing more coal in these circumstances for a given amount of electrical energy generated, it is difficult to see how the necessary quantity of heat units is to be supplied for the raising of the required steam. This is the point at which there should be junction between the gas and electricity industries, though just now there is little surplus gas coke available, partly owing to the favour in which it stands with manufacturers for the raising of steam. The gas industry must carbonize coal for the production of the urban and industrial necessity, gas, and for the realization of materials for the chemical industry. His Lordship indicates that a working union of the two industries is in his mind, when he says that an implied condition for the fulfilment of the recommendations of the Committee is a closer liaison between the gas and electrical undertakings; but he does not develop the idea. It is not only an implied condition if there is to be properly co-ordinated evolution in the utilization of coal and the production of energy.

One other point. We are doubtful whether it would be in the highest economic interests of the country to have the concentrations of production of power and chemical materials such as are suggested by the Coal Conservation Committee's report. It would tend to increase the concentration of industries and of workers in well-defined territories, instead of having them distributed as they are now. This would, we are afraid, lead to the impoverishment of many places in the country. Distributed production of energy, gas, and bye-products is probably of greater advantage to the country than would be the net "savings" (about the actuality of which little can be ascertained) from concentration of electricity generation.

It is a large question. It is one that requires discussing by men who have considered it in all its bearings. Will it be prominent at the forthcoming power conference at Wembley, and will Lord Weir have something more to say upon it?

Sulphate of Ammonia Manufacture and Neutralization.

THE Wales and Monmouthshire Institution of Gas Engineers and Managers last Wednesday week at Dowlais had a most interesting meeting—one which was so varied in its features as to remain a particularly memorable occasion. Everything was neatly dovetailed in; and the weather was benign, though of late it has consistently opposed both hopes and wishes. The President (Mr. W. Clark Jackson, of Neath) will look back upon the occasion as outstanding during his year of office. In Dowlais, generous greeting meets one everywhere. The report of our representative shows it; and the thanks which were heartily rendered were especially due to the Chairman of the Dowlais Gas Company (Dr. W. W. Jones, J.P.) and his fellow Directors, to their Manager (Mr. J. H. Jones), and to the Dowlais Steel Works, whose officers seemed to have but one object in life last Wednesday week—to show the visitors the wonders of their works, and to give them more than passing interest.

Here we are concerned with the technical proceedings at the meeting; and the item of predominant importance was the paper by Mr. C. Bateman, F.C.S., of the Cardiff Gas Company. His subject was the manufacture and neutralization of sulphate of ammonia. The limits of the art of manufacturing and neutralizing sulphate of ammonia have not yet been reached—in fact, it must be admitted that we are far from finality. Great progress has been made in providing an economical basis of production; but the field is wide for further improvement. Practically every part of Mr. Bateman's paper shows this to be so; and he fervently hopes that continued consideration and application of chemical and physical detail will do much to put the manufacture of this bye-product in its proper station in the gas industry. There is need for this, in view of the prospect of more extensive and intensive competition. At the present time, we have nothing much of which to boast in connection with sulphate of ammonia production; and a fairly constant reminder is given of this in the annual reports of the Chief Inspector of Alkali Works. Just consider the first prominent fact produced by Mr. Bateman. In the process of carbonizing, the splitting-up or distribution of the total nitrogen is approximately as follows: 15 p.ct. is evolved as ammonia, 5 p.ct. forms hydrocyanic acid, pyridine, and other organic compounds, 30 p.ct. appears in the gas, and 50 p.ct. remains in the coke. It is that 50 p.ct. in the coke that proclaims the amount of work there is to be done in improving the process so as to increase the yield, and turn it into marketable form. A good many years have passed since Mr. F. D. Marshall was exercising himself in driving home this fact. But what do we still see? Mr. Bateman says: "If all the nitrogen could be converted to "sulphate of ammonia, a coal with (say) 2 p.ct. of nitrogen "would yield 215 lbs. of sulphate per ton. In practice a "yield of 27 to 28 lbs. is usual." It is a far cry between the 27 and 28 lbs. and the impossible 215 lbs.; and the 27 to 28 lbs. is usual only in the best of regulated works. We have calculated the make of sulphate per ton from the accounts of many gas undertakings; and those below 27 lbs. are in a majority. In the researches in this matter, there have been surprises in finding works—some possessing chemical departments—in which the makes are in the neighbourhood of only 20 lbs. Mr. Bateman points out that the conversion of nitrogen to ammonia is increased considerably by the aid of steam, as in various types of vertical retort installations. There are the 46 and 42 lbs. production referred to at the meeting of the Institution last year, using vertical retorts and steaming. These results, it is clear, are not all due to steam, but partly to low-temperature working; and low-temperature working is not the best for maximum water-gas results. There is plenty of scope here for the investigation of the conditions which favour high yields, and of their relation to the promotion or degradation of results in other directions. The limits of research could be extended to the recovery of some of the nitrogen that at present eludes recovery and finds harbourage in the coke. Our future in the fertilizer market depends upon increasing the efficiency and economy of recovery and the process generally, so that we may be put into a ruling position in the home and export markets. That should be the objective. There is a great deal of research going on in respect of the applications of sulphate of ammonia and other fertilizers, but little to improve the process of production of the former. True, at the Leeds University Dr. S. Pexton, before his removal to London, studied (as Gas Research Fellow) the conditions of the liberation of nitrogen and sulphur from coal and coke; and the work has an important bearing. But this is more or less initial; and we have to get beyond it, by investigations into the application to daily practice of the best conditions of liberation.

Neutrality and dryness are essential qualities in sulphate to-day; and makers have been sensible of this, with the result that the percentage of the total aggregate production that is neutralized and dried leaves but a small percentage untreated. Even this will not be tolerated much longer. Mr. Bateman outlines the chief neutralizing and drying processes in operation; but in all these there is room for improvement—each having certain drawbacks, which, however, the improved product far outweighs. The chief processes—the caustic soda solution, the solution of soda ash, and the solution of ammonia—are sketched in the paper. It has also been attempted to use hot water alone; but experiments at the Grangetown Works of the Cardiff Gas Company have shown this to be unsatisfactory—the reason being, in Mr. Bateman's opinion, that the acid salt (ammonium bisulphate) is formed in manufacture; and it is theoretically and practically impossible to wash out this acid radical. Even if it were possible, the amount of salt lost would be so great as to make the method unpractical. The ammonia solution process is the one in use at present at the Grangetown Works—4 gallons of 0·5 p.ct. ammonia solution being used to neutralize 3 cwt. of sulphate of ammonia. There are disadvantages in neutralizing with ammonia solution—such as corrosive action of the ammonia on the copper baskets, linings, and spindles; and the formation of rock salt

in the saturator, on account of the excess neutralizing solution running back. Reference is also made in the paper to the gaseous ammonia process in use at Beckton; but only descriptively.

One thing is missed from the contribution. The author does not supply any particulars as to relative efficiencies and costs of using the different processes. Admittedly the subject is large, and in the time at disposal it was impossible to do more. Nevertheless, the paper has a considerable value, in that it not only directs attention to the great loss of nitrogen in the carbonizing process, but revives the important subject of neutralization. Towards the end, too, reference is made to details of working which tend to enhance the neutralizing results. We will not specify these here; those interested will turn to the paper for them. Generally, with all that has been done in connection with the manufacture of sulphate of ammonia, there is much room for further discovery—not in manufacture only, but in bringing to the plant a greater proportion of the original nitrogen in the coal.

Corrosion of Gasholder Sheeting.

IT is hoped that this subject will not be shelved, because there is no disputing that the life of a gasholder is a matter of no small importance, financially, to gas undertakings. The point is: Which is the more durable—steel or wrought-iron sheeting for holders, and which is the cheaper in the long run? Upon the question several men in the industry at home and abroad have expressed opinions; and among the most insistent that the matter should be investigated by a Joint Committee of the Institution of Gas Engineers and the Society of British Industries, are representatives of gasholder contracting firms—such as Mr. Milbourne and Mr. Samuel Cutler. They have made out a good case for investigation from their large experience, which has a distinct leaning to a reversion to the old wrought-iron sheeting, which would initially be more expensive than steel, but in the end, on account of its longer life, would work out cheaper. The last reference to the matter in our columns was on April 16 (p. 166). In the annual report of the Council of the Society of British Gas Industries, published last week, it is again raised, and interesting information was given by Mr. Milbourne in a subsequent speech, which information supplements that supplied at the previous meeting.

It must be admitted that the gasholder builders, in pressing this question, have nothing to gain by it other than a reputation for trying to serve their patrons in the best possible manner. But reading between the lines of the reference in the report, it is equally clear that the holder builders themselves are not unanimous on the subject; the statement is marked that "generally the feeling among the most important manufacturing firms is that, for durability and for the resistance of corrosion, iron of the 'old-fashioned' kind is certainly favoured; the one obstacle to its general use being the high price per ton in comparison with steel." But price should be divided by the probable years of life to ascertain whether the price is really high. It is said that one or two contractors have suggested that an increase in the thickness of the steel sheets would get over the difficulty, and also have the admirable advantage of giving the high pressures now being generally required. There again, increased thickness costs money, and that for an article which is proved to be more susceptible to corrosion than wrought iron—indeed, Mr. Milbourne suggests that it does not by any means follow that the life would be extended proportionately to the thickness. It seems to us that if there is to be an increased initial cost, then the money might just as well be spent on the material with the greater resistance to corrosion, and which gives the greater assurance that nothing particularly untoward is happening away out of sight. Mr. Milbourne instanced the failure through internal corrosion of the crown of a holder after only twenty-two years' service. It is anticipated that the holder builders will soon be very busy dealing with work of this kind, and there is no question that the earlier steel-sheet holders are getting weaker every year. The critical stage in many cases will certainly be reached before long. Another point by the same authority should be noted. It is that, when wrought-iron sheets are used, precautions should be taken to ensure that they are rolled from genuine puddled iron, free from any mixture of steel scrap, and containing a low percentage of sulphur.

There is no need to emphasize the importance of this subject to the industry, any more than there is to stress that of the qualities of refractory materials for use in coal carbonizing plants. The cost of a gasholder is not a light matter; and the aggregate capital invested in them is heavy. Expenditure on renewals, although necessary at some time or other, is not something that can be lightly regarded. Anything, therefore, which endows them with longer life should be welcomed. On this particular subject, the erectors of holders are not by any means dogmatic. What they say is that their experience of the relative life efficiencies of wrought iron and mild steel on the sheeting of holders suggests that there should be authoritative research into the matter. Upon the facts which they present, their suggestion can be readily endorsed.

Special Orders Procedure.

It will be a matter for extreme regret if Parliament does anything to detract from the value of the Special Order system in securing additional powers for gas and electricity undertakings. The expenses attaching to Private Bill procedure, particularly in opposed cases, have often been a very heavy burden to the smaller gas undertakings, and a deterrent to application for statutory powers—in fact, costs have in some instances mounted up to a figure which was nothing less than scandalous. Parliament will find in its archives the report of a Committee who made recommendations for easing the way, and lightening the expenses, of promoters of Private Bills. But no definite action has been taken upon that document. Then came the Special Order method of obtaining additional authorization by gas and electricity concerns, which method has been found good, and has had the effect of reducing costs and promoting expedition.

Action Foreshadowed.

But the procedure is menaced. It has been for some time past. Now positive action is foreshadowed in the minutes of the last meeting of the Central Executive Board of the National Gas Council. It is stated that the suggestion has been made in the House of Lords that Special Orders (both gas and electricity) should, in the first instance, be submitted to the Chairman of Committees and the Lord Chairman, who would decide whether or not the particular proposals were of such importance that they ought to be submitted to the ordinary Private Bill procedure before being passed into law. It has also been moved that a Select Committee should be appointed to consider the question of Special Order procedure, in order to retain adequate Parliamentary control. As pointed out by the Central Executive Board, this will be a very serious matter, especially for the smaller gas undertakings, to which the present procedure has been of immeasurable value in enabling them to bring their Private Acts up to date in an inexpensive and expeditious manner. A small Committee has been appointed to take whatever action is deemed necessary in an endeavour to preserve procedure which has about it so many commendable features.

Scotland and Section 1.

A report received from Mr. J. W. Napier, of Alloa, the Secretary of the District Executive Board for Scotland of the National Gas Council, refers to several subjects of interest, as will be seen by its reproduction in later columns. One of the matters dealt with is the extent of the application from Scotland for Orders under section 1 of the Gas Regulation Act. At the previous annual meeting, municipalities owning gas undertakings were strongly advised to apply for Orders, so as to bring their concerns into the therm line at May 15—the commencement of the Scottish authorities' financial year. There has been slow response; and the Director of Gas Administration (Mr. H. C. Honey) on Feb. 13 last wrote that it may be necessary for the Board of Trade to make an Order under section 1 in respect of each defaulting undertaking. If, or when, this is done, an Order will have the same effect as one applied for by the undertakers themselves. However, the Board of Trade are hoping that each authority will make early application. This will be much more satisfactory than a compulsory course. Up to the present, four Companies in Scotland have Orders, and 27 municipal authorities have them or have made application. There are still 33 statutory local authority undertakings without Orders, which fact shows a lack of freewill to move in this direction.

Gas and Electricity Combinations.

The movement for running gas and electricity undertakings in combination has got well on to a permanent road. Success in this respect required, so to speak, a protagonist who would make such combinations a speciality, and work for their development. Mr. A. Hugh Seabrook, of Sir Charles Bright and Partners, Ltd., has been effectively filling that rôle, with Mr. A. J. Stubbs and Lieut.-Col. H. W. Woodall as his co-workers. The latest success is Port Talbot. The Corporation there have, we hear, given Mr. Seabrook instructions to proceed at once with specifications and designs for an electricity supply system to be run in conjunction with their gas undertaking. This will make the fourth combined gas and electricity scheme which has actually been commenced through these specially directed efforts. Crowborough has been running a year, with almost phenomenal success; and the Oakham and Swanage stations are to be opened this month. We shall not be surprised to find that Retford and Spalding will be the next to get going. But, so far, Port Talbot is the most important, being a bigger plant than those of Oakham, Swanage, and Crowborough combined. The success in these cases will be an encouragement to other owners of gas plants where there is no electricity supply, and a demand exists for current, to go and do likewise. From the experience already obtained with this development, there is not the slightest doubt that very good profits and dividends can be earned, with low prices to the consumers, owing to the saving in expense—both capital and operating—that is brought about in combined undertakings of the kind.

Inerts in Coal.

Speaking of the purification of coal at the Empire Mining and Metallurgical Congress, Mr. F. S. Sinnatt said that, assuming 240 million tons of coal were transported annually, the dirt that could be hand-picked from it (without any other process of purification) would amount to 7,200,000 tons. This quantity is paid for as coal, and the cost of transporting has also to be met. But Mr. Sinnatt only calculates this dirt on a 3 p.ct. basis. The actual quantity of incombustibles in coal is much greater than that; so that the 7·2 million tons is a very modest computation. Nevertheless, the figure is sufficiently striking. Through such dirt, waste starts at the beginning and continues to spread itself wherever the coal goes, and through whatever process it is used.

Synthetic Ammonia.

An interesting article has appeared in "The Times" describing the development of the Billingham ammonia plant by Synthetic Ammonia and Nitrates, Ltd., which is a concern with a capital of five millions. The factory has been in operation since the beginning of the year. Already the daily output in the form of sulphate of ammonia is from 100 to 120 tons. This is to be doubled immediately, while the buildings and equipment are so planned as to be capable of much greater expansion.

The Vulnerable Point.

One lesson of the unauthorized railway strike in London, which began towards the end of last week, is provided by the men being fully aware that the big Lot's Road and Wood Lane electricity generating stations were the place to make effective their offensive action. They are the most vulnerable points in the intricate system of London's underground transport. Their declared object was to shut down the station; and completion of their aim was only defeated by the obedience of the members of the Electrical Power Engineers' Association to the instructions from headquarters. But the Strike Committee secured sufficient support at the stations from other grades of men to prevent a sufficiency of current being available for the running of a full train service. Thus once more the public are held up by a comparatively few men with a grievance; and this time in opposition to the ruling of the Unions themselves. The lesson is important in connection with the proposals to construct super-power stations for the general supply of electrical energy. Just try to imagine the trouble that would be occasioned to large industrial areas supplied from one super-power station, if a few discontented men could prevail upon the workers at the station to abandon it. Super-power stations are grand weapons in the hands of labour with a grievance.

Low-Grade Coal and Grit.

There has been a fairly large application of low-grade coal to steam-raising for electricity generation, on the ground of fuel cost savings. At the Nechells (Birmingham) electricity station, low-grade fuel has been employed, with economy so far as cost is concerned; but there has been an intolerable nuisance from grit. In consequence, there were complaints. Further appliances were put in, and better results were obtained. This was not enough; for people still complained. Through this the use of the low-grade coal has been temporarily abandoned. But ultimate success is not despaired of; other methods are being devised. Meanwhile, the change from gritty coal to good coal is costing the department £100 a day, or £35,000 a year; and this has all to come out of profits.

Engineers' Wages.

A number of engineering unions—the A.E.U. among them—have made a demand for an advance in wages of £1 a week. The unions have declined to discuss the question of the stabilization of the industry until the wages demand has been dealt with. The A.E.U. desire to stabilize wages with a minimum of 57s. per week.

Tar Removal from Hydraulic Main.

A device is illustrated in the "American Gas Journal" of April 26, which has for its object the automatic removal of tar from a hydraulic main. The arrangement, while admittedly not new, is simple in construction and said to be highly effective in action. A tank is located at some point below the level of the hydraulic main; and the bottom of this tank is connected to the bottom of the hydraulic main by a 2, 2½, or 3 in. tar pipe fitted with a cock. In this, pipes crossed with plugs for cleaning should be used in place of elbows. From the top of the tank a 1½-in. water pipe provided with a cock runs to the hydraulic main, entering a little below the regular water line. These two pipes are in addition to, and entirely independent of, the regular water supply, the overflow, and the tar take-off pipes already in the hydraulic. The tank is fitted with a water supply pipe and cock entering at the top, and a tar draw-off pipe and cock at the bottom. Assuming everything ready for action, and all valves shut, the tank is first filled with water. The cocks on the two pipes first mentioned are then opened, giving free communication with the hydraulic main. As tar is condensed in the hydraulic, it settles to the bottom, and finds its way through the lower of the two pipes into the bottom of the tank, where it displaces an equal bulk of the water in the tank, driving it out at the top, through the second pipe, into the hydraulic. Thus gravity draws the tar out, and fresh water replaces it in the hydraulic, so maintaining a uniform level. When it is desired to empty the tank, the water supply is turned on, and the tar is drawn off from the bottom. The water entering from the supply pipe helps to drive the tar out, and replaces it in bulk, so that the water level in the hydraulic is not affected. The tank should be large enough to hold easily a half-day's make of tar, and the tar should be drawn off once a shift—direct into the tar-well or into barrels placed beneath the tank. The advantages claimed for the scheme are that, as no tar can accumulate in the hydraulic, a comparatively clean water-well is maintained, thus minimizing back pressure; also, trouble from tar baking in the main is largely avoided.

Books Received.—From Messrs. Ernest Benn, Limited, No. 8, Bouverie Street, E.C. 4, we have received a copy of "The Specific Heat of Gases," by J. R. Partington, M.B.E., D.Sc., and W. G. Shilling, M.C., M.Sc. The volume is published at 30s. net. The Institute of Chemistry of Great Britain and Ireland have forwarded us the Fifth Edition of their List of Official Chemical Appointments. This has been compiled by the Registrar of the Institute, by direction of the Council and under the supervision of the Publications Committee. It may be obtained from the Institute at No. 30, Russell Square, W.C.

Low-Temperature Carbonization Plant for Nottingham.—It had been decided to erect a low-temperature carbonization plant on a site near Nottingham. Small coal will be treated there for the extraction of motor spirit and fuel and lubricating oils, and for the production of solid smokeless fuel. Sir H. Dennis Readett-Bayley, K.B.E., D.L., J.P., in a recent interview, said he hoped that Nottingham would be the first smokeless city in Great Britain. He emphasized the fact that a vast quantity of small coal in the mines of Britain could be converted into high-grade fuel by this method. It was absurd, he said, that Great Britain should have to spend £50,000,000 annually on oil, when science could turn their own coal mines into rich oil-wells. A plant with a capacity of 1000 tons of coal a day could yield over 7,000,000 gallons of crude oil and over 1,000,000 gallons of motor spirit a year. In addition, there would be 700 million c.ft. of high-grade gas.

PERSONAL.

Mr. SAMUEL MOORE has resigned the position of Managing Director of Moore's Gas Generator Syndicate, Ltd., owing to disagreement with the policy of those who are controlling the Company. Mr. E. B. MOORE has also severed his connection with the Company.

OBITUARY.

MR. T. V. FENN.

Deep regret, shared by us, will be felt by all on the news of the death of Mr. Thomas Vaughan Fenn, late Deputy Controller of the Gas Sales Department of the Gas Light and Coke Company. Mr. Fenn was a popular officer—a man who combined with a strong sense of justice a sympathetic and cheerful spirit. After having served the Company faithfully and well for over half-a-century, he retired in October last in expectation of a long and happy period of well-earned leisure, which, unfortunately, did not fall to his lot. The sympathy of all his friends will, we are sure, be extended to his widow and family in their bereavement.

Still fresh within our memories are two events in Mr. Fenn's life which showed how greatly he was appreciated by those with whom he came in contact. One of these occasions was in June last, when Mr. D. Milne Watson (the Governor of the Company), on behalf of the Directors, presented Mr. Fenn with a Louis-Seize clock, as a token of their appreciation of the loyal way in which all his duties had been carried out. The other happening was in the early part of this year, when Mr. F. W. Goodenough, on behalf of the staff, and Mr. E. Davey, for the workmen, made a presentation to him, and spoke of the high esteem in which he was held by all.

Mr. Fenn entered the Company's service in 1873, and was appointed to the Staff in August, 1878. In 1895 he was appointed Divisional Inspector; and when the new Gas Sales Department was created, he became Deputy Chief Inspector to Mr. Goodenough.

The funeral is to take place to-day, at Christ Church, Willesden Lane, Brondesbury, at 11 o'clock.

The death occurred on the 27th ult., at his residence, Wellington Square, Hastings, of Dr. EDWARD ROSSER MANSELL, one of the leading medical practitioners in the borough, where he had resided for over forty years. Deceased, who was 71 years of age, was a Director of the Hastings and St. Leonards Gas Company.

We are sorry to learn, as will be many friends in the gas industry, of the death on the 4th inst., at a nursing home in Cambridge, after an operation, of the wife of Mr. THOMAS A. GUYATT, of Ely.

ELECTRICITY SUPPLY MEMORANDA.

THE electricity supply industry has not been altogether happy in respect of the amount of attention it has received from successive Governments. The greater the political attention it has, the bigger the muddle in which it finds itself. It is not surprising. From the beginning of the industry, electrical writers and speakers have been unanimous in alleging that all the troubles and the trammels from which electricity undertakings have suffered have been originated and imposed by an over-officious and meddlesome Parliament. It is highly instructive to look back and see the truth of this; but it is only necessary to give one instance. The Electricity Commissioners had assigned to them by Parliament a duty which rose high above all their other functions, and that was to co-ordinate and concentrate electricity generation in the country. They have worked diligently; but with every little climb up the hill, they slip back again nearly the same length, so that slight progress has been made after years of labour. Development is proceeding on much the same lines as before. The Commissioners are still labouring, and are likely to do so, with very small effect in this direction. Now the Labour-Socialist Government are looking to electricity to help in the solution of the unemployment problem. It is really fantastic. Provision for electricity generation cannot profitably be made in excess of requirements, with a reasonable margin for an accession of business. No Government can compel people to use electricity, which is not the most economical agent for cooking and heating, and is not the most economical in all places for application to lighting and motive power. Moreover, electricity is a mechanically generated commodity; and therefore in any one place it does not, and cannot, give so much continuous employment on the high scale as the supply of gas.

Attentions of the Government.

Hackneyed Views.

It is perfectly plain the Government have not yet got electricity in proper perspective in relation to the unemployment question. In the recent debate on unemployment, Mr. Shaw said: "The Government are not satisfied that electricity is being thoroughly used yet, and they intend to make the most thorough investigation with a view to extending its use." We are pleased to see the words "most thorough," because no investigation could be so described which did not take into account the relative economies of other agents—gas, for example. The duty of a Labour-Socialist Government should be particularly to help those whose interests are nearest their hearts by securing for use the most economical means of labour-saving service in the house and in industry. The most economical labour-saving service for several purposes is not provided by electricity. But without Government aid, the gas industry has, through the instrumentality of the prepayment meter, placed labour-saving gas in the homes of about 4½ millions of people; and some 3 million consumers use gas through ordinary meters. It is interesting to note that Miss Bondfield believes it is most vital and important that the use of electrical power should be popularized. Her specific for producing more healthy conditions for electricity is that it should be talked about. Miss Bondfield does not know the electrical industry. She does not know of the talk and hyperbole of some of its men as to the virtues of electricity in respect of economy and efficiency. We may assure her there is no lack of talk. Miss Bondfield also thinks that electricity is of vital concern to the efficiency and development of our industries as a whole. She is an enthusiastic lady; but she does not know that power costs are but a fraction of the total works costs in our large industries. There are far more important things which industry requires in order to compete in the markets of the world. High taxation, high charges for labour, high charges for materials, are more vital factors in opposing the efforts of industry to accelerate its pace to a greater prosperity and to widen its ability to give employment. It is a pity the Government, before expressing through its members such a supreme faith in the efficacy of anything, do not carefully explore the position to see that the substratum of the ground upon which they propose to construct is sufficiently strong to bear the weight they are putting upon it.

Views from the Industry.

The "Electrical Review" considers that the attitude of the Labour Party is very satisfactory; and seeing that a Labour-Socialist Government have never held office before, it exonerates them entirely from any responsibility for legislation that has retarded the progress of electricity in the past. But our contemporary fervently hopes the Government "will be content to let the industry work out its own salvation—Government interference is fraught with peril." Then "Meteor" of the "Electrical Times"—far-seeing, piquant "Meteor"—writes: "Some people may think that all this honourable mention by the politicians is a great step forward. It is, indeed, significant that they should all seize upon electricity as a trump card to play. But we venture to think that they expect to derive far more benefit from electricity in catching votes than electricity will ever receive at the hands of their profession. It has been recorded in many electrical papers and discussions that the politician has a past. Perhaps the very worst evil that could betide us would be for the three political parties to begin fighting over us." "Meteor" is right. The "Electrician" is cautious. It cannot settle in its own mind whether or not it would be a good thing for the electricity industry to be taken under the wing of the Labour-Socialist Government. The speeches, it says, "indicate that electrical development is likely to become a plank in the platform of more than one political party. Time will show whether that will be advantageous or otherwise for the industry." We are inclined to think that further time is not necessary to settle that question. Has the "Electrician" overlooked nationalization?

Money for the Electrical Exhibit.

Our last-named contemporary is not satisfied with the amount of advertisement electricity gets. Whether or not the industry spends any considerable sum of money on advertisements proper, it is perfectly plain that it receives a large share of free publicity in the news columns of the papers. It fails to see that any effort is being made to advertise electricity in the way that is being done with gas in connection with Wembley. But we did not know that money was so tight for this purpose in the industry as is represented. "Is it not an open secret," asks our contemporary, "that to obtain sufficient money from the electricity supply undertakings to ensure the success of the 'B.E.D.A.' display at the British Empire Exhibition, cajolery, threats, prayers, and almost surgical operations had to be employed, in spite of the fact that never before was there such a chance of advertising electricity?" That is bad; but perhaps the indictment contained in the question is a little overdrawn.

Under-estimates of Requirements.

It has frequently been remarked that one of the methods of presenting electrical estimates of cost is to produce economies by under-prescribing the equipment for the purpose. This sort of thing later on results in the users having to incur additional expenditure in order to obtain something the effects of which will give them satisfaction. Westminster Bridge is one of the few electrically lighted bridges in London; but the illumination is very unsatisfactory. Its equipment consists of eighteen standards on the parapets, each supporting three lanterns, the fronts of which are comprised of three panes of glass. But in each lantern there is a lamp of

only 200 watts. The poor illumination has so impressed a Committee of the London County Council since they have been in possession of their new transpontine and palatial offices, that they have recommended there shall be improvement. With this object, they propose that the fronts of the two side lanterns on each standard shall be altered, so that each has a large single pane instead of three front panes, and that 500-watt lamps shall be substituted for the existing 200-watt ones. In other words, the total consumption for the bridge is to be increased from 10,800 to 27,000 watts per hour. The cost of altering the lanterns it is reckoned will be £108; and the additional annual cost of maintenance is estimated at £314. It is a pity a proper estimate was not in the first instance made of the requirements for lighting such an important bridge.

The Truro Scheme.

The Truro City Council are penitent—or rather the majority of the members are. They adopted a scheme for electricity supply, signed an agreement with a Power Company, applied to the Electricty Commissioners for their sanction, and an inquiry was held, which was noticed in the Memoranda for May 21. At that inquiry there were disclosures—eye-opening ones; and there have been more since. Now many of the councillors are persuaded they did not previously understand the position properly, and that they signed the agreement with the Power Company under a misapprehension. Better to find out these things late than never; but it would have been fittest if the actual position had been thoroughly appreciated some time ago—before affairs reached the length they have done. Now, too, the city councillors appreciate that the ratepayers must be considered in a matter of this kind; and they feel that the ratepayers are to-day fully awake to the fact that the scheme passed by the Council does not contain so much certainty of financial success as had been represented. This is not the time for speculation, which may adversely affect already heavily burdened tax and ratepayers. The Council have asked the Electricity Commissioners to assist them in arranging that the whole question of the supply of electricity in the city may be reconsidered.

Collusion in Tendering.

The Birmingham Corporation Electricity Committee have had experience of some remarkably close tendering, which has suggested that for the supply of electrical plant there exists a ring. The Chairman of the Committee (Mr. H. K. Beale) made disclosure of their "find" at the meeting of the City Council last week. He asserts that nearly all the manufacturers of electrical machinery are members of the British Electrical and Allied Manufacturers' Association ("B.E.A.M.A."), who, among other things—so Mr. Beale says—seem to have some control over the prices at which members should tender for contracts. We are not sure that this is the case; but we would rather assume that, if the ring or collusion exists, it is outside that body. It seems that about two months ago the Electricity Department wanted additional plant of a kind similar to some then being supplied by a firm with whom there was already a contract. Instead of placing the order with this firm at the outset, the Committee invited four other firms to tender. The lowest tender was £9000, and the highest £9765. These prices were such a large increase on that at which the Department were getting the machinery already on order that, states Mr. Beale, it was obvious the four firms were either in a ring or were being controlled by the Association. A curious thing happened. The present contractors got wind of the invitation to tender; and they said they were willing to take the new order as an extra upon their existing contract, or would put in a tender with the other four firms. They did so; and the price submitted was £9360—almost midway between the highest and lowest tender received from the four firms. But if the new plant was taken as an extra on the existing contract the price was £3615. If the firm could supply for £3615 as an extra on the existing contract, Mr. Beale held that the Committee were entitled to assume that was a fair price, and would yield a profit to the contractors. Even if there was no profit on the £3615 (which Mr. Beale does not think possible), then the bulk of the sum between the £3615 and the £9000 must be all profit. When these things occur, it has the effect of shaking confidence in tenders. Naturally, the Committee placed the contract as an extra on the old one; and so will get the work done for £3615. The Committee are now investigating whether or not there is any safeguard they can adopt against "profiteering" of this kind. Another instance was quoted by Alderman Bower. In this, tenders were submitted ranging closely round £27,000. The tenders were consigned to the waste-paper basket. Fresh ones were invited. To the surprise of the Committee, in every case £7000 was deducted from the first offer.

Wants of the Wareham Promoters.

By a prospectus dated May 30, the persons exploiting the Wareham Electric Supply Company, Ltd., are making a fresh effort to secure more money from a confiding public. The public will note an old campaigner in company promotions figuring as the Chairman of the Board of Directors—Sir Charles B. H. Soame, Bart. We have several prospectuses which bear that name. It is getting as well known as that of Eaton. Some of the companies are not being publicly run to-day under the Eatonian auspices—maybe for excellent reasons. The Wareham Company is one of the concerns with which the Electricity Finance and Distribution Company, Ltd., is associated; and regarding it, information has been previously given. It is obviously a valuable member in this company-promoting machine. The whole of the capital in the Wareham Company which the promoters desire the public to subscribe has not yet, in response to the repeated appeals, been forthcoming, and so the Directors are offering a "portion" of the authorized capital, which, to say the least, is exquisitely kind of them. The authorized capital is £10,500, divided into 10,000 "8 p.ct." cumulative preference shares and 10,000 ordinary or deferred shares of 1s. each. The issued and paid-up preference shares at Feb. 11 last numbered 6904, and the ordinary shares issued and paid up 1525, which latter figure only represents nominal capital at 1s. per share of £76 5s. It will be seen that there are 3096 preference shares still available for people who are anxious to sink money. The Directors, being kindly disposed towards the public, are willing to let them have some part of the 8 p.ct. preference shares at par, while the balance of the ordinary shares have a premium of 400 p.ct. placed upon them—that is to say, the 1s. shares are available at 5s.! This is all very wonderful and self-sacrificing. There is little said about profits; there are plenty of promises. "When the plant and mains are working at the *desired* capacity, the revenue will be in excess of the amount required to pay the fixed dividend of 8 per cent. on the preference share capital with *a margin* for the ordinary shares"—*i.e.*, the 1s. shares for 5s.! We can all "desire" the conditions for producing a profitable revenue; but whether or when the "desire" will be consummated is another matter. People will have to be very unintelligent to allow money to be drawn from their pockets by this prospectus.

NATIONAL GAS COUNCIL.

Central Executive Board.

The Central Executive Board of the National Gas Council met on June 3—Alderman F. S. PHILLIPS in the chair.

DRAFT ANNUAL REPORT AND ACCOUNTS.

The Draft Annual Report and Accounts for the year ended March 31 were submitted, amended, and approved for presentation at the Sixth Annual General Meeting on July 8.

GEYSER SPECIFICATION.

A report, a specification of suggested constructional features to be embodied in the manufacture of geysers, and an instruction book in connection with their fixing, which had all been prepared by the Specification Committee, were approved by the Board.

SALE OF COKE.

It was reported that the Public Control Committee had issued a report to the London County Council pointing out that no effective legal action could be taken to remedy the delivery of short weight in the sale of coke by retailers; the provisions of the Weights and Measures Act, 1889, relating to coal not being applicable to coke. The Public Control Committee suggest that statutory power should be obtained whereby coke should be sold by weight. The London County Council have made it clear that gas undertakings are in no way to blame, but are as anxious as that body that purchasers of coke should be fairly treated.

SPECIAL ORDERS.

It was reported that the suggestion had been made in the House of Lords that Special Orders under the Electricity (Supply) Acts and Gas Regulation Act, &c., should in the first instance be submitted to the Chairman of Committees and to the Lord Chairman, who would decide whether or not the particular proposals were so important that they ought to be submitted to the ordinary Private Bill procedure before being passed into law. It had also been moved that a Select Committee be appointed to consider the question of Special Orders procedure, in order to preserve adequate Parliamentary control. It was pointed out at the Central Executive Board that this would be a very serious matter for the smaller gas undertakings, as the present Special Order procedure had been of immeasurable value in enabling such undertakings, in an inexpensive and expeditious manner, to bring their Private Acts up to date. It was decided to appoint a small Committee to take action in this matter.

LONDON TRAFFIC BILL.

It was reported that Sir Henry Maybury had promised to receive a Joint Deputation from the Council and the British Water Works Association on the 5th inst., with regard to representation being given to public utility undertakings on the Advisory Committee set up under the above Bill. The Board appointed two representatives to attend this deputation.

ORDNANCE SURVEY MAPS.

It was reported that an endeavour was being made to discontinue the issue of 6-in. Ordnance maps in quarter-sheets; and the Council were asked to support the Geological Society of London in a protest against such action. The Council agreed to appoint a representative for this purpose.

WORLD POWER CONFERENCE.

Members were reminded of the meetings of the Gas and Fuel Section of the World Power Conference at Wembley, on Monday, July 7 which it was hoped would be well attended.

INSTITUTION OF GAS ENGINEERS.

AGENDA FOR THE ANNUAL MEETING.

The following agenda have been prepared for the annual general meeting, to be held at the Institution of Electrical Engineers, Victoria Embankment, London, on Tuesday, Wednesday, and Thursday, June 24, 25, and 26, under the presidency of Mr. Samuel Tagg, M.Inst.C.E., Engineer and Manager of the Preston Gas Company.

Advance copies of the reports and papers are available for members making application for them.

Tuesday Morning, June 24, at 10 a.m.

Minutes of the last Annual General Meeting to be submitted for confirmation.
Appointment of scrutineers for the examination of balloting lists for election of Officers and Council, members, and associate members.
Presentation of Institution's Gold Medal to Mr. Stephen Lacey, B.Sc., for his paper on "The Flow of Gas in Pipes."
Presentation of Diplomas in Gas Engineering awarded under the Institution's Education Scheme.
Address of the President.
Annual Report of the Council, and accounts for the year ended Dec. 31, 1923.
Report of Advisory Committee on Education, to be presented by the Chairman, Mr. F. W. Goodenough.
Proposed revision of Education Scheme.
Proposed revision of Articles of Association 6 and 7.
Eleventh Report of the Gas Investigation Committee. "Aeration in Atmospheric Burners."
Discussion on the Eleventh Report.

(Adjournment at 12.45 p.m.)

Tuesday Afternoon at 3.15 p.m.

Twelfth Report of the Gas Investigation Committee. "Waste-Heat Boilers attached to Continuous Vertical Retorts."
Discussion on the Report.
Thirteenth Report of the Gas Investigation Committee. "Standard Methods of Testing Gas Cookers."
Discussion on the Report.

Tuesday Evening at 8 p.m.

Reception and dance, by invitation of the President and Mrs. Tagg, at the Connaught Rooms, Great Queen Street.

Wednesday Morning, June 25, at 10 a.m.

Annual General Meeting of the Benevolent Fund.

AGENDA.

Minutes of the last Annual General Meeting to be submitted for confirmation.
Annual Report of the Committee of Management for the year 1923-24, and accounts for the year ended Dec. 31, 1923.
Announcement of election of two members of Committee of Management to succeed those retiring in order of rotation.
Other business.
After the meeting of the Benevolent Fund the meeting of the Institution will be resumed.

Institution Meeting.

Paper on "The Regenerative Coal Gasification System at Aylesbury," by Mr. A. G. Lane, of Aylesbury.
Discussion on the paper to be opened with communications by Mr. Morris W. Travers, B.Sc., F.R.S., and Mr. F. W. Clark.

(Adjournment at 12.45 p.m.)

Wednesday Afternoon, at 3.15 p.m.

Report of Institution Gas Research Fellowship: "The Gasification of Coke in Steam, with special reference to Rates of Gasification and Composition of Gas Produced," by Mr. Stuart Pexton, Ph.D. (Institution Gas Research Fellow), and Professor John W. Cobb, C.B.E., B.Sc., F.I.C. (Livesey Professor).
Discussion on the Report.
Paper on "Silica Gas Retorts," by Mr. W. Emery, of Stoke-on-Trent.
Report of Refractory Materials Joint Research Committee, to be introduced by Mr. J. P. Leather, Hon. Secretary to the Committee. The following, presented to the British Refractories Research Association, are included, with the permission of the Department of Scientific and Industrial Research: (*a*) Note on the Storage of Silica Refractories, by Mr. W. J. Rees, B.Sc.Tech., F.I.C. (*b*) The Relation between Ordinary Refractoriness, Under-Load Refractoriness, and Composition, Physical and Chemical, of Refractory Material, Part I., by Mr. A. J. Dale. (*c*) Note on Refractoriness under Load, by Dr. J. W. Mellor. (*d*) Sedimentation as a Means of Purifying Clay, by Mr. S. R. Hind, B.Sc. (*e*) The Effect of Repeated Burning on the Structure and Properties of Lime-Bonded Silica Bricks, Part I., by Mr. W. Hugill, B.Met., and Mr. W. J. Rees, B.Sc., F.I.C. (*f*) Some Causes in the Variation of the Sizes of Refractories—Bricks and Blocks, Part I., by Dr. J. W. Mellor. (*g*) The Thermal Conductivity and some other Properties of two Commercial Heat-Insulating Bricks used in Kiln Construction, by Mr. A. T. Green. (*h*) The Influence of Texture on the Transmission of Heat through Firebricks, by Mr. A. T. Green.

Thursday Morning, June 26, at 10 a.m.

Paper on "The Construction of New Coal Gas Works at Garston," by Mr. R. E. Gibson, of Liverpool.
Discussion.
Scrutineers' report.

Presentation of Presidential Certificate.

Nomination of the respective Presidents of the American, French, and Italian Gas Associations for Election as Honorary Members of the Institution.
Place of meeting next year.
Votes of thanks.

Thursday Afternoon.

Visit to Paris.

The party visiting Paris for the celebrations of the Centenary of the Gas Industry in France and the Jubilee of the Société Technique de l'Industrie du Gaz en France, and Gas Exhibition, leave Victoria Station, Southern Railway (S.E. and C.S.) at 4 p.m., arriving Paris (Nord Station), *via* Dover-Calais, at 10.55 p.m. The return train leaves Paris (Nord Station at 10 a.m., Monday, June 30, arriving Victoria at 5.10 p.m.

Friday, June 27, at 11 a.m.

A wreath will be deposited at the Cenotaph, Whitehall, by the Senior Vice-President, simultaneously with the rendering of a similar tribute in Paris by the President on the grave of the Unknown Warrior, at the Arc de Triomphe de l'Etoile.

Visit to the British Empire Exhibition.

Members are requested kindly to note that it is not intended to make any special arrangements for conveyance to Wembley, nor for admission to the Exhibition.
The Fuel Research Board have extended an invitation to members to visit their exhibit in the Government Pavilion.
Arrangements have been made for the party to lunch together at the Great Stadium Restaurant at 1 p.m. Tickets 10s. 6d. (exclusive of wine), for which application should be made to the Secretary not later than June 16. Ladies accompanying members are invited.

ANNUAL REPORT OF THE COUNCIL.

The Council of the Institution of Gas Engineers have submitted to the members their report upon the present position and the work of the Institution during the year 1923-24.

MEMBERSHIP.

At the end of the year 1923 the total of all classes on the roll was 1002, against 977 for the year before, an increase of 25. Mr. Bernard Parkinson was elected an honorary member.

TRANSFERS AND STUDENTS.

The names of those transferred from the class of associate member to that of member are: Kenneth R. Gandon, Bath; William A. Howie, Gravesend; and William H. Reed, Warwick. The following have been admitted as students during the year: William R. Branson, West Hartlepool; Harold G. Broadbridge, Leamington; Alexander G. Grant, Leeds; Reginald W. Hilham, Gorleston; Edward C. Le Jeune, London; Maurice R. Nicholson, Fareham; William H. Noble, Lea Bridge; Joe B. Preston, Liversedge; Charles D. Terry, Leamington; Charles C. Wood, Wellingborough; Stewart L. Wright, Birkenhead.

DEATHS.

The Council have to record, with expressions of regret, the deaths of the following: William Chew, Blackpool; Joseph Davis, Gravesend; Alfred J. Edwards, Taunton; George F. L. Foulger, London; William D. Hunter, London; John S. Lucking, Witney; Paul Mallet, Paris; Philip Monson, London; Henry Morley, Teignmouth; John Niven, Bradford; Arthur F. Phillips, London; James Robb, Chepstow; Thomas Settle, Leeds; David Terrace, Middlesbrough; William H. Y. Webber, London. M. Paul Mallet and Mr. Thomas Settle were honorary members of the Institution; Mr. Niven, elected in 1867, and Mr. Terrace, elected in 1881, were among the oldest members; and Mr. Robb at the time of his death was serving as District Member of Council representing the Wales and Monmouthshire District Institution.

NATIONAL GAS COUNCIL.

The Institution have been represented on the Central Executive Board of the National Gas Council during the year 1923-24 by Messrs. J. Ferguson Bell, James Paterson, James D. Smith, and Samuel Tagg.

AFFILIATED DISTRICT ASSOCIATIONS.

The seven affiliated District Associations have been repre-

sented on the Council of the Institution during the same period as follows:

Eastern Counties Association . .	Mr. T. F. Canning.
Manchester District Institution . .	Mr. Harold Davies.
Midland Association	Mr. Percy N. Langford.
North British Association	Mr. J. M. Smith.
North of England Association . .	Mr. John Kelly.
Southern Association	Mr. L. J. Langford.
Wales and Monmouthshire District Institution	Mr. O. Thomas.

Annual General Meeting.

The annual general meeting took place in the City Hall, Belfast (the use of which, for the purpose, had been kindly granted by the Corporation), on Tuesday, Wednesday, and Thursday, June 26, 27, and 28, 1923, under the Presidency of Mr. James D. Smith, J.P., M.Inst.C.E., Engineer and Manager of the Corporation Gas Department. Particulars are included in the report.

British Engineering Standards Association.

The Council regret to report that Dr. Charles Carpenter, having resigned his seat on the Main Committee of the Association as representative of the Institution of Civil Engineers, has also relinquished his position as representative of the Institution of Gas Engineers on the Association's Cast-Iron Pipes Committee. Mr. Albert Stokes has been appointed his successor on the latter. A contribution has been voted to the Association towards the cost of the initial experiments on sockets for cast-iron pipes for water, gas, and sewage. Mr. Robert Watson was appointed to represent the Institution at a conference convened by the Association to consider the desirability of establishing British standard specifications for materials and apparatus used in connection with illumination, a matter which was brought under the notice of the Association by the National Illumination Committee. As a result of the conference, the Association have decided to establish a Sectional Committee on Illumination, of which the National Illumination Committee will form the nucleus. Mr. Stephen Lacey has been appointed to represent the Institution on the Association's Sub-Committee on Screw Threads. With reference to the proposed standardization of gas flanges, a Sub-Committee under the Chairmanship of Mr. T. Hardie are preparing a report for the Sectional Committee on Pipe Flanges. Steps are being taken with a view to a definite recommendation being made on the matter.

Standardization of Plugs of Gas-Taps.

Conferences have been held with representatives of the Society of British Gas Industries as to the desirability of standardizing plugs for gas-taps, as a result of which an angle of taper of 7 degrees with a tolerance of 15 minutes in either direction has been unanimously agreed.

National Illumination Committee of Great Britain.

Mr. W. J. A. Butterfield, Mr. J. G. Clark, Dr. H. G. Colman, Mr. F. W. Goodenough, and Mr. Robert Watson represent the Institution on this Committee. Mr. Butterfield and Mr. Watson have been nominated as delegates to the next meeting of the International Commission on Illumination, which is to be held at Geneva from July 21 to 25 next. The report of the Chairman (Lieut.-Col. Kenelm Edgcumbe) for the year 1923 is reproduced, [This report will be found in the "JOURNAL" for May 7, p. 385.]

Institution of Civil Engineers Heat Engine and Boiler Trials Tabulation Committee.

In response to an invitation from the Institution of Civil Engineers, the Council have appointed the following representatives to serve on the Heat Engine and Boiler Trials Tabulation Committee of that Institution: Messrs. William B. Booth, Walter Chaney, Stephen Lacey, and E. W. L. Nicol.

Kelvin Medal.

The Trustees of the Kelvin Medal Trust have reported to the Institution that, after consideration of representations from the leading engineering bodies in all parts of the world, the Award Committee have decided this triennial award in favour of Prof. Elihu Thomson, of Lynn, Mass., U.S.A., as being the most worthy to receive this recognition of pre-eminence in the branches of engineering with which Lord Kelvin's scientific work and researches were closely identified.

Kelvin Centenary.

Arrangements are being made by the Royal Society for the celebration of the centenary of the birth of Lord Kelvin, born on June 26, 1824. The celebrations are to take place on July 10 and 11. Invited to nominate a representative of the Institution to serve on the Committee of Honour, the Council have appointed Mr. J. Ferguson Bell.

Science Museum.

The Institution were represented at a meeting of delegates of various technical and scientific societies, which had for its object arrangements for pressing on the Government the necessity and importance of providing adequate accommodation for the Science Museum at South Kensington without delay. A resolution embodying the views expressed at the meeting has been communicated.

Shipping Engineering and Machinery Exhibition.

An official visit of the Institution to the Shipping Engineering and Machinery Exhibition at Olympia, London, took place on Monday, Sept. 10, 1923.

Public Works, Roads, and Transport Congress and Exhibition (1923).

The Institution undertook the arrangement of a conference at the Public Works, Roads, and Transport Exhibition (1923), which was held at the Royal Agricultural Hall, London, from Nov. 22 to 29. The President (Mr. Samuel Tagg) occupied the chair at the conference, which took place on Nov. 28, when the following papers were presented and discussed: "Quality and Composition of Town's Gas," by Mr. H. E. Bloor, of York, and "The Position of Mains in Public Highways," by Mr. Stephen Lacey, of London.

International Foundry Trades Exhibition.

At the request of the Birmingham Chamber of Commerce, the Council have accorded the patronage of the Institution to the International Foundry Trades Exhibition, which it is proposed to hold from June 19 to 28, 1924.

British Empire Gas Exhibit Committee.

This Committee, elected under the auspices of the National Gas Council, the British Commercial Gas Association, the Gas Companies' Protection Association, the Institution of Gas Engineers, and the Society of British Gas Industries, have been responsible for the organization, design, and equipment of the Gas Exhibit at the British Empire Exhibition opened at Wembley on April 23, 1924, by His Majesty the King. The consummation of the arduous work of the Committee has been the production in the Palace of Industry of an excellent co-operative gas exhibit representative of the whole British Empire. It has been carried out with a view to attract the interest of the general public, and must thereby materially develop the utilization of gas for domestic, industrial, and other purposes. An official inspection took place on Wednesday, May 14, and was numerously attended.

First World Power Conference.

In connection with the First World Power Conference, taking place at the British Empire Exhibition from June 30 to July 14, a Gas and Fuel Section has been formed. The Institution have been invited to participate in the meeting of the Section which is to be held on Monday, July 7, when a number of papers will be submitted for discussion.

Royal Sanitary Institute.

Mr. Harold E. Copp, of Hull, and Mr. John Kelly, of Bridlington, represented the Institution at the congress of the Royal Sanitary Institute, which took place at Hull from July 30 to Aug. 4, 1923.

National Gas Exhibition, Birmingham.

The Institution were identified with the National Gas Exhibition, which was so successfully held at Birmingham from Sept. 17 to Oct. 3, 1923. A meeting of the Council was held at the Council House of the Birmingham Corporation during the course of the Exhibition.

Association of Dutch Gas Engineers.

The Institution were honoured with an invitation to be represented at the meeting of the Association of Dutch Gas Engineers held at Amsterdam on Oct. 15 and 16, 1923, in celebration of their jubilee. The President and Secretary attended, and were most cordially and hospitably received.

Smoke Abatement League of Great Britain.

Arrangements are being made by this organization for holding in November, 1924, a Smoke Abatement Exhibition and Conference at the City Hall, Deansgate, Manchester, with the object of exploring in a practical manner all the possible and likely avenues of escape from the smoke evil. The Council have assented to the name of the Institution being added to the list of patrons.

Education Scheme.

The Advisory Committee on Education consists of: Mr. F. W. Goodenough (Chairman), Messrs. Samuel Glover, T. Goulden, Walter Hole (Organizing Secretary), and Samuel Tagg, representing the Institution; J. Bridge and S. B. Chandler, representing the Junior Gas Associations; A. Abbott, C. H. Creasey, W. Gannon (co-opted), Drs. A. Morley and A. Jamieson Walker, representing the Board of Education; Mr. J. T. Ewen, representing the Scottish Education Department; and Prof. Thomas Gray, representing the North British Association of Gas Managers. The following form the Board of Examiners:

Gas Engineering.—Messrs. H. D. Madden (Cardiff), W. J. Smith (Bolton), and J. S. Thorman (London).

Gas Supply.—Messrs. S. B. Chandler and Stephen Lacey (London), and J. Wesley Whimster (Bath).

Mr. Madden was elected Chairman of the Board of Examiners.

The Consultative Committee is composed of the Advisory Committee and Messrs. W. Calderwood (Association of Technical Institutions), Major T. Worswick (Association of Principals of Technical Institutions), Harold Hunter (Association of Teachers in Technical Institutions), Prof. John W. Cobb, and Mr. F. S. Sinnatt.

The report of the Advisory Committee will be presented at the forthcoming annual meeting of the Institution.

Refractories.

Mr. A. E. Broadberry and Mr. W. E. Price continue to represent the Institution on the Council of the British Refractories

Research Association. The Refractory Materials Joint Committee of the Institution and the Society of British Gas Industries have arranged with the Research Association for reporting at the forthcoming meeting of the Institution several communications of interest to the gas industry which have appeared in the Association's Bulletin. A Paper on "Silica Gas Retorts" is also being prepared for the meeting by Mr. W. Emery.

GAS INVESTIGATION COMMITTEE.

The Joint Committee on Gas Heating, Lighting, and Ventilation Research of the Institution of Gas Engineers and the University of Leeds have continued to act as Research Sub-Committee for the Gas Investigation Committee of the Institution. That Sub-Committee have regretfully received the resignation of Mr. H. E. Bloor, who had shown great interest in the work of the Committee during his time of membership. Mr. H. Pooley has been appointed by the Council of the Institution in his place. No change has taken place in the constitution of the staff.

Mr. James W. Wood, assisted during most of the year by Mr. G. B. Howarth, has been continuing his careful study of the aeration of burners, and a report on the subject will be forthcoming at the June meeting. This subject has now been carried to the stage of working on actual burners—lighted and unlighted. The thanks of the Institution are due to the Leeds Corporation Gas Department and their Manager (Mr. C. S. Shapley) for the laboratory facilities they have provided in connection with this work.

Dr. A. Parker, with the assistance of Mr. H. Kerr, Dr. Monkhouse, and (for the period of the most important tests) Mr. G. B. Howarth, has been engaged upon an evaluation of the efficiency of waste-heat boilers attached to settings of continuous vertical retorts at the Windsor Street Works of the Birmingham Corporation Gas Department. A study of the working of the built-in gas-producer has also been made so far as practicable. The results will form the substance of the Twelfth Report of the Committee, to be presented in June. This brings the work of the Committee at Birmingham to a close for the time being, and a very sincere expression of thanks is made for the facilities which have been extended there for a number of years by the Birmingham Corporation Gas Department, through their General Manager (Mr. A. W. Smith), and for the willing and effective co-operation of their staff—particularly Mr. Foster (Chief Engineer), Mr. Rhead (Chief Chemist), Mr. Bamber, and Mr. Pearson.

The Sub-Committee of the Gas Investigation Committee, appointed to consider Standard Methods of Testing Gas-Cookers, consists of Messrs. A. E. Broadberry (Chairman), C. F. Botley, E. V. Evans, T. Goulden, P. S. Hoyte, W. E. Price, W. J. Smith, and Samuel Tagg; and the following were co-opted: Mr. J. G. Clark, Mr. A. Forshaw (Chemist to Sub-Committee), Dr. H. Hartley, and Mr. J. W. Wilson. The important work, which was started over a year ago, has been progressing steadily, in spite of the many difficult problems which have arisen at almost every stage of the investigation; and at a meeting of the Gas Investigation Committee held on Nov. 12, 1923, an interim or progress report from the Sub-Committee, dated Nov. 2, 1923, was presented. At that stage, however, it would have been rash to draw definite conclusions, and the interim report in effect pointed the way for further work to determine the right lines to adopt by which to draw-up a series of standard tests. Mr. Forshaw's work has now been concluded prior to his taking up a new appointment in Scotland, and it is intended to present a report from the Sub-Committee, recommending certain standard tests, at the forthcoming annual meeting of the Institution.

The Council wish to express their appreciation of the assistance received from the Gas Light and Coke Company in providing facilities for carrying out the tests; and also the kind indulgence of Messrs. R. & A. Main in consenting to Mr. Forshaw's delaying his date of taking up his work at Falkirk, in order to finish this work for the Institution.

CORBET WOODALL SCHOLARSHIP.

This scholarship continues to be held by Mr. Alexander G Grant, who passed his intermediate examination for the B.Sc. degree in Gas Engineering last June, and will complete his second year of study this month.

LIVESEY MEMORIAL PROFESSORSHIP.

This Chair, established in the Department of Coal Gas and Fuel Industries in the University of Leeds, continues to be ably filled by Prof. Cobb. Teaching and research work have followed the normal course. The special lectures on the Manufacture of Coal Gas have in the past been given by Dr. H. G. Colman, but to the regret of the University, he has found himself unable to continue this work. The course has been divided now into parts. The first part of the course, on Carbonization Practice, has been placed in the hands of Mr. Rhead, Chief Chemist of the Birmingham Gas Department; while Mr. Hollings, then Senior Gas Chemist of the South Metropolitan Gas Company, but since appointed Chief Research Chemist to the Gas Light and Coke Company, has given the second part of the course on Gas Purification.

Most of the work done during the year on fuel problems has been reported to the Institution; while Mr. Houldsworth, as Research Assistant on Refractory Materials, has contributed papers to the Ceramic Society on that subject. Interesting investigations have been made through the Joint Benzole Research Committee of the University of Leeds and the National Benzole Association, and the first report of that Committee has been made to the Association. The Research Chemist to the Committee (Mr. E. C. Williams) has during the year become the first occupant of the newly-established Ramsay Memorial Chair of Chemical Engineering in the University of London, and Mr. W. H. Hoffert, M.A., B.Sc. (Oxon.), has been appointed in his place.

What will mark an epoch in the history of the Department and its association with the gas industry has been the completion during the year of the experimental gas plant which has been erected by Mr. Henry Woodall in the Leeds University as a memorial to his father, the late Sir Corbet Woodall. The opening ceremony on March 26 was attended by representatives of the gas industry (including the President of the Institution) and of the University, when the gift of the plant was formally made by Mr. Woodall and received by the Pro-Chancellor.

GAS RESEARCH FELLOWSHIP.

Dr. Stuart Pexton, who was awarded the degree of Doctor of Philosophy by the University of Leeds last June, on account of work which he had carried out as Gas Research Fellow, has continued the study of the gasification of carbon in steam in another direction, with special reference to rates of gasification and composition of gas produced. Owing to his recent appointment on the research staff of the Gas Light and Coke Company, Dr. Pexton has just resigned the Gas Research Fellowship; but the results of the year's work will be contributed in the form of a joint paper by himself and Prof. Cobb at the June meeting of the Institution. Steps have been taken to appoint a successor to Dr. Pexton as Gas Research Fellow.

TESTIMONIAL TO PROF. SMITHELLS.

On his retirement from the Chair of Chemistry at the University of Leeds, a subscription list was opened with the object of placing on record an appreciation of the services rendered by Prof. Smithells in the discharge of his academic and public duties during a period of thirty-eight years. Recognizing the invaluable help rendered to the gas industry by Prof. Smithells during the progress of the research work of the Gas Investigation Committee, the Council felt that members of the Institution would be glad of the opportunity to assist personally in this tribute of esteem. Contributions were therefore invited, and the sum of £145 16s. was received from them in response. It is understood that the total amount subscribed to date assures the main object of the fund being realized—viz., to establish in the name of Prof. Smithells a Fellowship or Scholarship at the University of Leeds.

WROUGHT-IRON TUBING INQUIRY.

The attention of the Council having been called to the quality of so-called wrought-iron tubing and fittings generally supplied, a questionnaire was issued to members. A Committee consisting of the following have been appointed to consider the replies and to investigate the whole subject: Messrs. Albert Stokes (Chairman), J. Ferguson Bell, James E. Blundell, Fred Davies, Stephen Lacey, James Paterson, W. E. Price, Samuel Tagg, Frank P. Tarrant, and R. H. Ruthven (Hon. Secretary).

LIBRARY.

Appended to the report is a list of the donations to the library received during the year, for which the Council desire to express their acknowledgments. Works of interest on any branch of gas engineering are always acceptable and much appreciated.

ACCOUNTS.

A copy of the accounts for the year ended Dec. 31, 1923, is also appended, duly certified by the Auditors (Mr. Sydney Y. Shoubridge and Messrs. Wood, Drew, & Co.).

PRESIDENT FOR THE YEAR 1924-25.

When considering the nomination of the President for the ensuing year, the Council received a letter from Mr. J. Paterson, Senior Vice-President, intimating his inability to accept nomination for that office. The Council extended to Mr. Paterson their fullest sympathy in the circumstances which compelled his decision, and expressed their great regret that at this juncture he is unable to consummate the distinguished service he has rendered the industry through the Institution, by accepting nomination to the office of President.

SAMUEL TAGG, *President.*
W. T. DUNN, *Secretary.*

June 5, 1924.

THE BENEVOLENT FUND.

In presenting their annual report on the working of the Fund, the Committee of Management state that during the year under review regular assistance has been given in thirteen cases. From the particulars received from members who are kindly acting as visitors, it is certain that by the grants voted the objects of the Fund are being well attained. Subscribers will be gratified to know that, by their help, the burden of those associated with the Institution whom adversity has overtaken has been appreciably relieved. It may be added that the Committee have felt constrained to make increases in some of the grants, but venture to suggest that the amount needed in that respect will be adequately supplied by members who have not hitherto subscribed.

The income for the year ended Dec. 31, 1923, amounted to £677 2s. 10d., derived from the following sources: Subscriptions, £280 5s. 5d.; donations, £233 17s. 3d.; interest on investments, £123 17s. 7d.; interest on deposit account, £5 0s. 6d.; and recovery of income-tax, £34 2s. 1d.

In assistance to widows, orphans, and members the sum of £405 3s. was granted. Printing and stationery cost £29 13s. 10d.; and postages, receipt stamps, &c., £6 18s. 3d., leaving a credit balance on the year of £236 4s. 9d. (approximately the amount of the donations), which has since been invested in accordance with the usual practice.

The Committee regret that the list of regular subscribers to the Fund has again been curtailed by the hand of death, a circumstance which necessitates an earnest appeal for fresh help.

While cordially thanking all who have supported the Fund, the Committee desire with special expressions of gratitude to acknowledge the generosity of Mr. W. A. Surridge, of London, in contributing the sum of one hundred guineas. A list of the subscribers and donors is appended to the report, as also a copy of the audited accounts.

The two members of the Committee retiring by rotation after three years of service are Mr. Herbert Lees, of Hexham, and Mr. Frank Prentice, of Ipswich. To serve in their places the Committee have nominated for election Mr. Thomas Goulden, of London, and Mr. G. S. Frith, of Runcorn.

NATIONAL GAS COUNCIL—SCOTTISH DISTRICT.

The Fifth Annual Meeting of the Scottish District Executive Board took place on Tuesday, May 21, in the City Chambers, Glasgow. Councillor Stewart (Convener of the Edinburgh Gas Committee) presided. The annual report was submitted, showing 110 gas undertakings in Scotland in the membership—66 company and 44 corporation concerns.

ANNUAL REPORT.

Gas Regulation Act, 1920.—At the last annual meeting the proposal was unanimously agreed to that municipalities owning gas-works be advised to take early steps to adopt the Act, and to apply the therm system of charge as from the commencement of the financial year—namely, May 15, 1924. Town councils have been slow in making application for Orders; and Mr. Honey (Director of Gas Administration), in a letter of date Feb. 13 last, stated that it might be necessary for the Board of Trade to make an Order under section 1 of the Gas Regulation Act, 1920, in respect of each undertaking. In effect, this means that the Board, after giving three months' notice to the undertakers, may make an Order which shall have the same effect as an Order made on the application of the undertakers. Mr. Honey further stated that he was desired by the Board of Trade to express the hope that each Authority may see its way to make the necessary application at an early date. The following are the names of the undertakings in Scotland who have obtained an Order, or have made application:

Companies (4): Busby, Coatbridge, Stirling, and Musselburgh. Municipalities (27): Greenock, Hamilton, Paisley, Glasgow, Arbroath, Alloa, Edinburgh, Dunoon, Dunfermline, Johnstone, Perth, Lanark, Dumbarton, Bridge of Allan, Falkirk, Dumfries, Airdrie, Renfrew, Peebles, Grangemouth, Motherwell, Lanarkshire County Council, Kirkintilloch, Inverness, Dundee, Troon, Denny, and Dunipace.

The Municipalities in Scotland owning gas-works number 60.

Scheme for Sale of Tar and Ammoniacal Liquor to Distillers.—The scheme has been in successful operation for the past five years, the period of agreement decided upon by parties in 1919. As a result of negotiations with the distillers, a slightly amended agreement has now been reached, to continue for a further five years commencing May, 1924. The monthly awards of values will be determined as before by Mr. Thomas Henderson, Chemical Broker, Glasgow. The following statement gives the prices for the twelve months ended April, 1924, the rates as at distillers' works; railway dues being payable by the gas undertakings:

		Tar. Per 100 Gallons.	Liquor (4° Tw.). Per 100 Gallons.
		s. d.	s. d.
1923.	May	61 11½	3 10 375
	June	56 1½	3 10·375
	July	57 5½	3 10·375
	August	56 0	3 10·375
	September	53 1	3 7·125
	October	51 9	3 7·125
	November	48 10	3 2·25
	December	42 10	3 2·25
1924.	January	38 5½	3 2·25
	February	34 1	3 2·25
	March	34 1	3 2·25
	April	29 10	3 2·25

Parish Council Assessment.—The Committee have been engaged in ascertaining the position of gas undertakings in the matter of the assessment by parish councils, and the percentage deduction granted under section 37 of the Poor Law Act, 1845. Considerable diversity of practice by Parish Councils has been found to exist, the allowances off the gross valuation as appearing in the roll varying from *nil* to 75 p.ct. The evidence has now been collected, and a statement of the position will be circulated.

Valuation of Gas-Works for Assessment.—The valuation, taxation, and rating of municipal undertakings, including gas undertakings, has been the subject of investigation and report by the Convention of Royal Burghs, with the view of amending the present method of valuation. The proposals are concerned with basis of valuation, objections to the present revenue basis, lack of uniformity by different Assessors, and gas undertakings being valued at extravagant amounts as compared with trading concerns of higher capital value. There is suggested as a basis (*a*) that of percentage on the capital value of gas-works; (*b*) percentage representing interest (but not sinking fund) on the cost of construction; (*c*) that differential rating of gas-pipes as between burghs and counties (the former giving 75 p.ct. deduction, the latter on full rental) should be abolished.

Income-Tax.—Gas-works should be assessed on an average of three years, so that losses can be averaged with profits, the same as with nearly all trading concerns; public utility undertakings should not be worse treated. As gas undertakings are directly concerned with the proposals, application has been made for representatives from the gas industry to act along with the Sub-Committee of the Convention; and this having been granted, two members from the Committee have been appointed to act.

Royal Commission on Mining Subsidence (Evidence from Scotland).—On behalf of gas undertakings situated in mining areas subject to disturbance and loss due to subsidence, and in view of the visit of the Commission to Scotland, a gas engineer has been selected to give local evidence as to damage.

Electric Lighting (Scotland) Act, 1890.—This Act, passed at the time of the inception of electric supply, applies to Scotland only, and has the effect of authorizing a town council who own both the gas and electricity undertakings to meet out of the receipts for gas any deficit on the working of the electricity undertaking. The effect of this Act in recent years has been so serious that in some instances gas consumers—particularly slot consumers of the artizan class—were contributing largely towards the losses incurred by the electricity undertaking. The amendment of the Act is highly desirable. The attention of the Central Executive Board, London, has been directed to the subject, and steps will be taken to secure amendment.

MANAGEMENT COMMITTEE.

The Management Committee for 1924-25 was appointed:
Chairman: Councillor Stewart, Gas Convener, Edinburgh.
Vice-Chairman: Bailie Slorach, Gas Convener, Hamilton.
Secretary: Mr. J. W. Napier, Gas-Works, Alloa.

The following twelve members, along with the Chairman and Vice-Chairman: Messrs. James Dickson (Johnstone), T. W. Harper (Ayr), L. Hislop (Uddingston), Bailie Hunter (Perth), George Keillor (Greenock), Capt. Kennard (Falkirk), John Lang (Alexandria), J. W. M'Lusky (Glasgow), Samuel Milne (Aberdeen), J. W. Napier (Alloa), T. M. Smith (Stirling), Alex. Yuill (Dundee).

Representatives on the Central Executive Board, with year of retiral—Councillor Stewart (1925), Bailie Slorach (1926), Mr. J. W. Napier (1927), and Mr. L. Hislop (1928).

A Waterless Holder for Michigan City.

The Bartlett-Hayward Company, of Baltimore, have secured the contract to erect in Michigan City, for the Northern Indiana Gas and Electric Company, a waterless holder of a capacity of 1 million c.ft.—the first one of its kind to be put down in America. This pattern of holder has been developed in Germany, where the first one was built in 1915. It is the invention of Herr Conrad Jagschitz, of the Maschinenfabrik Augsburg-Nürnberg, and consists of a rigid roofed-in shell, fastened to a base plate, and containing a piston which rises and falls according to the pressure of the gas. [See "JOURNAL," Vol. 159, p. 268.] A preparation of tar is used for sealing purposes round the piston. The holder will be 105 ft. in diameter and 160 ft. in height. There will be provision for enlargement, should additional capacity be needed at some future time. An additional 50 ft. may be put on to the height of the holder, making the total measurement in this direction 210 ft., and bringing the capacity up to 1,350,000 c.ft. The holder will be built of steel plates 20 ft. long and 32 in. high, which will be riveted and welded together, making a solid steel shell. After the foundation work is completed, the roof and piston will be built; then the piston and roof will be raised with compressed air as the side-wall plates are put together. On top of the roof will be a glass enclosed inspection room or monitor, 8 ft. in diameter; and round the top of the holder just below the roof will be a band of wired glass about 3 ft. in height, to admit light to the top of the holder above the piston, in case it becomes necessary for workmen to enter at any time. A register on the side of the holder will indicate the amount of gas contained in it. In addition to an iron stairway to the roof and the monitor house, there will be three galleries round the outside of the holder. In Michigan City the absence of a water-seal, which must be kept from freezing, is an advantage. There are in use in Germany, France, and Holland, 46 holders of this type, and many others are now under construction, including one with a capacity 4 million c.ft.

Scottish Junior Gas Association (Eastern District).—Aberdeen is the place selected for the annual outing and visit of the Association next Saturday (June 14). Meeting at the gas-works at 11.45, there will be a tour of inspection, followed by luncheon through the courtesy of the Aberdeen Corporation Gas Committee. An invitation by the Gas Committee to an afternoon drive is extended to members and their lady friends.

BRITISH EMPIRE EXHIBITION NOTES.

The Gas Exhibit.

As will have been noticed from the reports in the Daily Press, large attendances have been registered at Wembley—the official figures for Whit Monday being no less than 321,232—and as the Gas Exhibit has continued to attract at least its fair share of visitors, the handsome building in the Palace of Industry which is dedicated to the necessary adjunct to modern civilization in which "JOURNAL" readers are more particularly interested has presented a busy scene. The working industrial displays are a never-ending "draw;" and the value from an educational point of view of this section of the exhibit cannot be placed too high, for one hears time after time remarks by the public which show their surprise at the revelations regarding the possible applications of gas to industry. This portion of the display is, indeed, a valuable asset to the industry as a whole; but this remark can fairly be applied to everything that is shown. Since comment was last made on the model hotel kitchener, it is noticed that a new and complete set of apparatus by another maker has been installed.

The varied domestic and industrial uses of gas are further emphasized by a magnificent series of full-plate photographs, mounted on movable screens which have been placed on either side of the main entrance to the Gas Exhibit.

Inquiries continue to grow in numbers, and many of them are important in character. In this connection it may be mentioned that a small addition—but a useful one—has lately been made. Round the two balls boxes have been attached to the walls, and small tables placed near-by—visitors desirous of information on special points being asked to fill in one of the cards provided for the purpose (adding their name and address), and place it in the box. This is appreciated by those persons who may wish for enlightenment on one matter or another, but yet hesitate to approach the staff on the subject.

A number of representatives of the gas industry—who express warm approval of what has been accomplished—have been within the past few days taking a look round their exhibit, which was also honoured with a visit last week by their Imperial Highnesses the Prince and Princess Asaki, of Japan. On this occasion the Prince remarked upon the fine character of the Gas Exhibit, and made particular reference to the artistic settings of modern gas-grates.

Glancing at the historical section, one is attracted by the valuable display of old meters. One could inspect here the first dry meter of Thomas Glover, dated 1844; and, in addition, there is a copy of the "JOURNAL" for Oct. 10, 1849, which is opened at a page showing Clegg's wet meter of 1816, and Malam's wet meter of 1819. This exhibit is included because it illustrates the earliest type of meter that could be referred to. In those days the "JOURNAL"—or the "JOURNAL OF GAS LIGHTING," as it then was—was published quarterly, at the price of 1s.

Many people are at present gleaning their first knowledge of what the inside of a gas-works is like from a plain and practical illustrated leaflet, tastefully got up and well written, which is distributed by the British Commercial Gas Association. This is entitled "A Visit to the Gas Works; What the Story Tells Us."

THE NATIONAL PHYSICAL LABORATORY.

The exhibit of the National Physical Laboratory is extensive, and admirably indicates the amount and the value of the work undertaken by the Laboratory at Teddington. It is divided into several sections, of which that relating to pure engineering is given first place. It is in what may be described as the general section that the gas engineer will find immediate interest; and we propose to give a brief description of some of the exhibits in this section which appeal, by reason of their primary application, to those connected with the gas industry.

ELECTRIC ARC FURNACE.

An electric arc furnace for working under high gaseous pressures is shown. This, which was designed by Sir Joseph E. Petavel, K.C.B., D.Sc., F.R.S., Director of the National Physical Laboratory, is employed in the investigation of reactions at high temperatures under gaseous pressures up to 200 atmospheres. It is fitted with carbons which are soldered into cups carried on water-cooled screw supports, which latter can be moved into or out of the furnace by means of large nuts. Specially designed stuffing-boxes serve the double purpose of making gas-tight joints and providing the necessary electrical insulation. The main steel forging forming the body of the furnace is water-cooled and is provided with a cast-iron liner. A window consisting of a glass or quartz cone ¾ in. thick enables observations of the arc to be made, while other openings serve to introduce gas at high pressure, and to allow of the provision of a pressure gauge.

GAS HEATED MUFFLE THERMOSTAT.

In the furnace section a thermostat electrically controlled from an expansion thermo-regulator is shown. This is demonstrated as applied to a gas-heated muffle. The regulator is of metal and silica, and the expansion causes an electrical contact to be made for a time which is longer the lower the temperature. When this contact is made, a 3 volt circuit, which includes the coils of a Post Office relay, is completed. The relay then breaks a 100-volt circuit flowing through an electrically operated gas-valve. The latter consists of a solenoid with a resistance of some 3000 ohms, in the axis of which hangs a plunger carrying a ball. This ball is pulled up on its seating so as to turn-off the gas while the current is flowing, and falls clear of the seating when the current is off. By means of an adjustable by-pass, an independent gas supply to the burners is arranged to be sufficient to keep the muffle some 50° or

GAS PLANT REPRESENTED IN THE PALACE OF ENGINEERING.

so below the required temperature. The fraction of each minute during which the extra quantity of gas passed by the open valve is added to the by-pass supply is controlled by the movement of the contact point of the thermo-regulator. The temperature of the muffle is recorded on a drum.

THE METAL AND SILICA THERMO-REGULATOR.

The thermo-regulator used in the gas-heated muffle depends for its action on the difference in expansion between a metal bar and a silica tube containing it. The latter extends through and beyond the insulation of the muffle. The metal bar lies entirely within the muffle, and its ends bear against silica rods or tubes for similar diameter, by means of which the difference in expansion between the metal and the outer silica tube is transferred to the extremities of the latter independently of any variations in temperature outside the muffle. At one end a screw adjustment fixed to the outer tube enables the position of the metal bar and of its silica extension pieces to be varied, in order to vary the working temperature. At the other end the extension piece bears against a lever the pivot of which is carried by a brass tube fixed to the outer silica tube. By means of a second lever, the difference in expansion is again magnified so that the movement of a contact point at its end is about 20 times as great as that of the "free" end of the metal. This contact point may thus be pushed towards or withdrawn from what is virtually a fixed contact attached to the brass tube—*i.e.*, the outer silica tube of the regulator. The position of contact is, however, made more definite, and the response to temperature change rendered more nearly proportional to the amount of change, by causing the latter contact to oscillate about a fixed position. The oscillation is obtained by linking the contact pin to a connecting rod the far end of which is rotated by a crankshaft with a throw of ⅛ mm. The crankshaft is driven by clockwork at a speed of about 1 r.p.m.

HYGROMETERS.

Many forms of hygrometer are shown, all of which are of great interest. There is an experimental chamber in which the humidity can be adjusted and maintained constant for investigating various types of hygrometer, and a dew-point apparatus indicating electrically at a distant point. The action of the latter is most interesting. A light shines on a mirror, the dimming of which by the deposition of moisture causes a reduction in the amount of heat radiation reflected. Several patterns of hair hygrometer are exhibited. In one, the indications are given at a distant point by measuring the resistance cut out by a moving arm which depends for its movement on the length of the hair. In another the extension of the hair is measured by a micrometer head fitted with electrical contacts. There is a wet and a dry bulb hygrometer fitted with a direct-reading humidity scale. A wall dew-point hygrometer is shown which is particularly applicable for cold stores. In this instrument the mirror is cooled by the circulation of brine. Another hygrometer is demonstrated in which a current of the moist air is drawn from the space under investigation.

Among the other exhibits of special interest may be mentioned an electrical resistance furnace, a series of thermo-couples, and two show cases, one of which explains the methods of investigating the manufacture and failure of metals, and the other containing specimens of different types of insulating material.

ATOMIC MODELS.

Finally, those interested in the structure of matter will find a series of models demonstrating the atomic structure, as obtained from X-ray analysis, of various compounds. The compound Mg_2Si is shown as a face-centred cube of silicon atoms intermeshed with a simple cubic lattice of magnesium atoms. The units of magnesium and silicon are shown for comparison with the compound. Magnesium is a close-packed hexagon; the distance between the atoms being the same in the pure metal and in the compound. Silicon is a diamond structure—*i.e.*, two intermeshed face-centred cubic lattices. The structure of AlSb is a face-centred cube of antimony atoms intermeshed with a similar lattice of aluminium atoms. The structure is the diamond type. Comparison with the models of antimony and aluminium shows that the side of the antimony lattice is almost the same as that of the compound. Antimony consists of two intermeshed face-centred rhombs. In the compound the rhomb becomes a cube, and one of the lattices of antimony atoms is replaced by a lattice of aluminium atoms. α and γ iron, copper, and β brass are shown. α iron—the variety which exists at room temperatures—is a body-centred cube. At about 950° C. it changes to γ iron—a face-centred cube. Copper is a face-centred cube with dimensions nearly the same as those of γ iron; and β brass (50 p.ct. Cu., and 50 p.ct. Zn) is a centred cube similar to α iron.

THE "BELLING" COOKER.

A cooker of considerable interest in the electrical section of the Palace of Engineering is a new model known as the "Belling" electric cooker. The oven is designed on novel lines; the heating element being round the inner casing. The pin contact principle is employed, and the outer casing of the oven is lagged with asbestos. Five heating elements are controlled by four switches, and there are three heats—low, medium, and high. On the low heat, it appears, two small heating elements on the hot-plate are brought into action, so that if it is desired to warm the contents of one pan only, the heat in the other element is running to waste. This does not seem scientific. Another interesting exhibit on this stand is an immersion heater fitted with a new type of heating element which is easily withdrawn in case of trouble. It has been specially designed to screw into existing tanks or hot-water cylinders, to supplement the heating. It is provided with three terminals, so that, when connected to a series-parallel switch, three degrees of heat are obtainable.

DANIEL ADAMSON & CO., LTD.

Apart from the samples exhibited by Daniel Adamson & Co., Ltd., of Dukinfield, the stand itself claims much attention on account of its simplicity and pleasing design. The central exhibit is a turbo-compressor direct coupled to an Adamson-Rateau steam turbine. This unit is the latest in turbo-compressor practice. The normal duty is 14,400,000 c.ft. of free air per 24 hours at a pressure of 100 lbs. per sq. in. This exhibit demonstrates in an arresting manner the great progress made by this firm in the centrifugal type of compressor. The machine under review offers many advantages in connection with driving and in the avoidance of pressure oscillations. The tendency to surging, with its inseparable shocks, noisy working, and high temperatures, has been entirely overcome. By means of a patent design of suction control valve gear, automatic regulation down to no load is ensured, the compressor running economically on all loads. Other exhibits on this stand are two Adamson high-efficiency compressed-air motors of 7 H.P. and 12 H.P., one of which is in operation. In addition to the rotary compressor mentioned above, an electrically-driven reciprocating compressor may also be seen running. The drainage side of the firm's activities is exemplified by an interesting and instructive working model.

CHEMICAL TOPICS FROM CURRENT LITERATURE.

Notes from Recent Technical Publications.

By H. J. HAILSTONE.

THE SPONTANEOUS COMBUSTION OF COAL.

A paper on this subject, read by J. I. Graham before the Birmingham Section of the Society of Chemical Industry, has been published in the Journal of that Society. This reviews some notable contributions to the study of this important problem, and gives an account of valuable experimental work done by the author and other workers. The class of coal, its friability and fineness of division, its initial temperature and moisture content—all these affect the rate of heating up. The influence of pyrites is discussed, and its dangerous nature when finely divided emphasized. Other factors such as the adsorption of gases, and the composition and physical nature of the coal are also dealt with.

COKE COOLING.

"The Engineer" for May 9 gives an account, with photographs and drawings, of the dry coke-cooling plant erected at Rotterdam by Messrs. Sulzer Brothers. Data and experimental results from this plant, which deals with six metric tons per hour, show an efficiency of heat recovery of 80 p.ct. In this, the first commercial plant of its size, the hot coke from chamber ovens is filled into a brickwork chamber, and hot air drawn from it through a water-tube waste-heat boiler to a fan which circulates it again through the body of cooling coke. The gaseous atmosphere is rapidly exhausted of its oxygen, and no coke is consumed. From time to time the cooled coke is withdrawn from the bottom by means of a valve. This particular plant has been in successful operation for sixteen months, and has provided valuable data for the construction of further and larger plants under consideration at various coke-ovens.

DELETERIOUS EFFECTS OF GAS.

A serious instance of corrosion in a gas-heated radiator is given by U. R. Evans in "Chemistry and Industry," and this may be recognized as no isolated case. A thick incrustation had formed at the base of the radiator as a direct result of sulphur-dioxide corrosion. Other damage to ornaments and fittings was noted, and attributed to the use of sulphur-containing coal gas. The achievement of the South Metropolitan Gas Company in producing a gas containing only 8 grains of sulphur per 100 c.ft. is cited as a "notable step in the right direction."

"Science Progress" publishes in its April issue a contribution by J. H. Priestley entitled "Tar, Smoke, and Coal Gas as Factors Inimical to Vegetation." This is a study of the problems grouped under this heading, and contains an extraordinarily good list of references to the English, American, French, and German contributions to the literature of the subject. After discussing the effect of tar vapours, the writer deals with the effect of illuminating gas, and instances the damage done to certain trees by gas leakages. Limes and poplars are more susceptible than many other species. The poisonous action appears to be mainly due to the unsaturated hydrocarbons in the gas; and the physiological explanation of this process is given. A remarkable statement is that tomato plants will indicate the presence of a minute trace of gas much less than could be detected by its smell, and carnation blooms and pea seedlings will react to one part of ethylene in a million. The possibility of gas leaks causing toxic action in a

greenhouse is mentioned; but one would hesitate before blaming gas for one's horticultural failures. One feels that another side could be started with considerable success, and the virtues extolled of bye-products of gas manufacture for stimulating and protecting plant-growths, and of gas itself as a means towards smoke abatement.

THEORY OF THE INCANDESCENT MANTLE.

A study, by R. L. Swan, of the catalytic effects of thorium and cerium oxides on the combustion of gas, appears in the Transactions of the Chemical Society. In these experiments pure thorium and cerium oxides were prepared from the respective oxalates, and an examination was made of the effect of heating them in an atmosphere consisting of a mixture of pure hydrogen and oxygen in the proportion to form water. For this purpose a standard area of the oxides in the form of a paste was spread upon a glass plate, and then heated to 450° C. in a tube containing the gases. At this temperature a reaction occurred, and the hydrogen and oxygen slowly combined. The velocity of the reaction was measured by the contraction in volume of the gas during a given time; and it was found that the reaction proceeded most rapidly in the presence of a mixture containing about 1 p.ct. of ceria and 99 p.ct. of thoria. This proportion is similar to that found most suitable for the manufacture of incandescent mantles, and it is suggested that the cerium behaves as an oxygen carrier, or that it causes greater ionization of the gases, and so promotes more vigorous reaction.

LABORATORY APPLIANCES.

By the use of a viscometer designed by F. M. Lidstone (Transactions of the Society of Chemical Industry), no correction for density of the liquid is necessary, as the working head of liquid is eliminated. The instrument consists of a capillary tube, with stopcock and two bulbs, bent twice upon itself. Determinations of the viscosity of lubricants, &c., are conveniently and quickly carried out with only a small volume of the liquid. A different type of apparatus is that described by E. Berl and others in the "Zeitschrift für angewandte Chemie." This consists of a balance, on one arm of which is suspended a vertical pointed wire to the top of which is attached a vertical pointer. The wire is suspended down to the pointer in the oil to be examined, and is counterbalanced. By noting the time of swinging through a given distance with different weightings of the scale-pan, viscosities at various temperatures may be deduced. This apparatus is claimed to be particularly useful for viscous liquids and mixtures such as cylinder oil or tar.

A device by W. Murray (Transactions of the Chemical Society) is for use with mercury thermo-regulators, which often cause trouble owing to the mercury sticking from time to time. This consists of two towers joined at the bottom and containing water. The gas supply to the regulator passes into the top of one tower (the other is open to the atmosphere) through an inlet tube fitted with a float-actuated valve, and then passes out through another tube at the top. By this means a pulsating pressure of gas to the thermostat is obtained, about thirty pulsations occurring per minute. This causes very slight pulsations in the mercury column of the regulator, thus overcoming any tendency to stick.

"Industrial and Engineering Chemistry" publishes L. E. Dawson's arrangement for maintaining constant pressure differences in a partly exhausted system. To the apparatus under suction is connected a mercury trap having two tubes of different bore. These dip into a vessel of mercury, the wider one being more deeply immersed. When the pressure in the apparatus falls, mercury is drawn up from the reservoir, and allows air to enter through the narrower tube when its end becomes uncovered. Thus pressure is raised in the apparatus, and the mercury falls back again and seals the end of the narrow tube. Adjustment of the length of tube allows any required conditions to be met; and by slight modification, work at pressures higher than atmospheric may be conducted. The apparatus does not ensure constant pressure, as variations in barometric conditions correspondingly affect the system, and slight adjustment is necessary for constant-pressure work.

Gas Fuel for Cooking.

In a paper presented at the annual meeting in Chicago of the Illinois State Gas Association, Mr. James W. Cohn, efficiency engineer, dealt with the subject of "Selecting the Best Fuel for Commercial Cooking." After full consideration of the three available cooking fuels met with in Chicago—that is to say, gas, coal, and electricity—the conclusion has been arrived at that coal as a fuel for commercial cooking is fast becoming only a memory, and that electricity is in its experimental stage, is inherently the wrong kind of fuel to use, and has up to the present date proved a failure. After agreeing upon the essentials of an ideal fuel for commercial cooking, each fuel has been measured against this ideal, and it has been found that gas possesses the following advantages: It conserves natural resources; it is the most reliable fuel; it is unquestionably the most economical fuel; in filling the practical requirements of flexibility it is without a peer; and it is a hygienic fuel. It is up to us, who are interested in the gas industry, declared the author, for the safety of the future generation and the present consumer, to propagate the use of gas as a cooking fuel.

NEW GASHOLDER AT COATBRIDGE.

Official Inauguration.

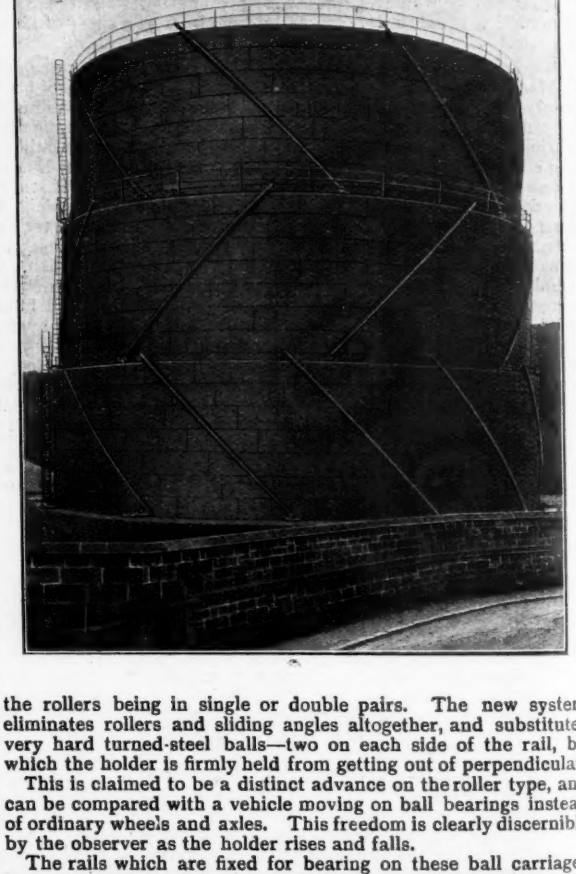
An interesting function took place at Coatbridge on Wednesday afternoon of last week, when the Coatbridge Gas Company inaugurated a new three-lift spiral-guided gasholder by Messrs. Robert Dempster & Sons, Ltd., of Elland. A report of the opening proceedings will be published next week, but meanwhile we give the following short description of the holder.

The capacity of the holder, which has just been put into operation, is about 320,000 c.ft. It has been erected in the tank which formerly contained a worn-out 47 years old two-lift column-guided holder.

The holder is a three-lift and about 80 ft. in diameter by 24 ft. 6 in. deep, and when fully extended will stand about 70 ft. above the tank.

Though there are several novel features in connection with the internal framing of this holder, generally speaking it is designed and built in a similar manner to hundreds of others; but with regard to the guiding arrangement for securely holding the lifts at any height, this is a new departure—the Coatbridge holder being the second one built with "Elland" rails and patent four-ball carriages made entirely of steel stampings.

Other spiral gasholders are held in position and assisted in rising and falling by means of rollers mounted on carriages;



the rollers being in single or double pairs. The new system eliminates rollers and sliding angles altogether, and substitutes very hard turned-steel balls—two on each side of the rail, by which the holder is firmly held from getting out of perpendicular.

This is claimed to be a distinct advance on the roller type, and can be compared with a vehicle moving on ball bearings instead of ordinary wheels and axles. This freedom is clearly discernible by the observer as the holder rises and falls.

The rails which are fixed for bearing on these ball carriages have also been specially designed for this method of guiding, and weigh 79 lb. per yard; the outer portion being formed as a double ball-race, and the inner portion, clear of the ball-race, so arranged that water can easily and quickly be carried away from the top into the tank.

There is also another novelty—at least as far as the Coatbridge Works are concerned—and that is the method of reaching the top from the ground. The usual way is by means of vertical steel ladders fixed to the side of the holder, which, under the best conditions, afford very little room for hands and feet; whereas on the new holder, ordinary ladders are fixed on the tank, and for each section of the holder, at right-angles to the holder but at an ordinary slope, thus affording ample room for hands and feet, and greater security in ascending and descending.

London and Southern Junior Association.—A visit to the Reading Gas-Works is to be made next Saturday afternoon (June 14) by the London and Southern District Junior Gas Association, when members will assemble at 2.30 at the entrance to the works. Ladies are invited to join the members at tea.

YORKSHIRE JUNIOR GAS ASSOCIATION.

Visit to the Works of Messrs. Drakes Limited.

Over a hundred members of the Association, under the Presidency of Mr. W. Heathcote (Halifax) attended the last gathering of the session on Saturday, May 31, on the occasion of a visit to the works of Messrs. Drakes Limited, gas and constructional engineers, Halifax. Assembling in the large drawing office, which had been temporarily turned into a reception room, the visitors were welcomed by Mr. M. T. Thompson on behalf of the firm. Mr. J. Wilfrid Drake (Chairman and Managing Director), who had intended to be present to offer the welcome, was in London in connection with the meeting of the Society of British Gas Industries, and sent a telegram expressing his regret at not being able to attend, and hoping all present would have an enjoyable and profitable visit. Mr. Thompson also tendered an apology for the absence of Mr. C. W. James, who was on the Continent in connection with new plant there.

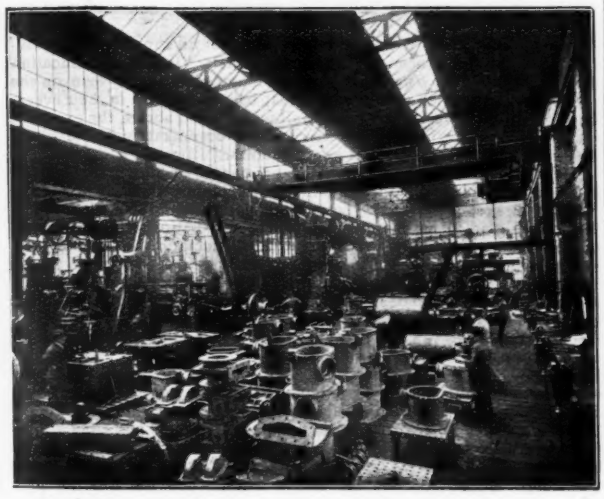
THE OVENDEN WORKS.

The members were formed into parties, and proceeded first round the Ovenden Works, under the guidance of Messrs. J. W. Moore, W. Peace, W. C. Barnes, W. E. Thompson, W. Mitton, and T. Heley. Included among the visitors were Messrs. W. B. M'Lusky (Halifax), J. Bridge (Elland), G. Dixon (Lancaster), and H. Hutchinson (Barnsley).

Messrs. Drakes had arranged for certain machinery to be in operation in order that the visitors could see the actual working conditions of manufacture. The first object of interest was a retort built of Meltham silica blocks, with a fireclay neck. A Drakes patent tubular regenerator furnace, showing air channels and step-grate furnace, was closely examined. Many details in construction were explained to the visitors. A vertical retort, built of silica segments, was next seen. Passing to the erecting shop—a huge building where all types of gas-works plant are assembled—the parties saw in course of completion hydraulic and foul mains, bends of special dimensions, purifiers, and purifier covers. A travelling overhead crane is installed for easy transportation. A big purifier, having six boxes, was seen to be near completion, and also a small purifier, with two boxes. Considerable attention was devoted by the members to the automatic door for the coke-quenching bench, for use with the hot-coke transporter.

In the foundry, work was being carried out in the moulding of various sections, and great interest was evinced in the work in connection with a 24-in. special cast-iron bend, and mouthpieces. The mechanical moulding of arch pipes was in progress; it being explained that by this method it was possible to mould four in the time occupied in moulding one under the older system. A further advantage was the absence of ramming the sand, except a small amount at the top of the mould. Press moulding was also seen in operation, and a sample of the "Rafrakton" metal was examined in section. A pneumatic hammer was in operation, chipping-off the rough parts at the joinings in the castings, while workmen were busily engaged fettling castings.

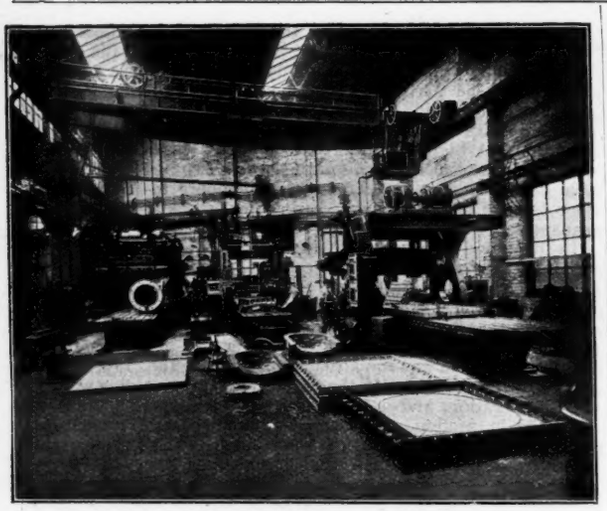
The stores and pattern shops were visited, the number of patterns and general stock carried being seen to be enormous. In the machine shop a high-speed lathe was working, a cut of $\frac{3}{32}$ in. reducing the diameter of the bar being operated upon. A turret lathe and planing and other machines were working, and the members saw the planing of thick pieces of metal. Drakes' automatic chimney-draught regulator was explained, and this very ingenious device attracted favourable comment from all present it being pointed out that the installation of this regulator would keep the settings at a fixed temperature even though a gale arose during night-time, because the wind pressure against a movable



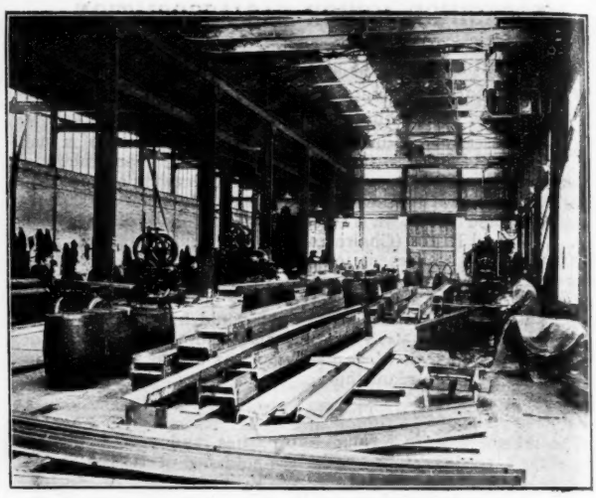
One of the Machine Shops, Drakes Limited.

Power Forging.

SOME WHO BRAVED THE RAIN TO FACE THE CAMERA.



Battery of Planing Machines.



One of the Structural Steel Shops.

door acted upon the regulator and closed it or opened it just sufficiently to counterbalance the action of the wind. The forging of the mouthpiece crossbar by the aid of a compressed-air hammer and a skilled man who deftly manipulated the red-hot bar was witnessed. In the boiler shop were hydraulic presses dealing with dredger buckets, plates for scrubbers, &c.; also punching and shearing machines, a pneumatic riveter, and a battery of radial drills. The electric power house was inspected. The current for this is obtained from the Corporation and transformed. A steam-driven electrical generating plant is used as a stand-by.

THE HOLMFIELD WORKS.

The visitors then proceeded to the Holmfield Works of the firm, where the first object of interest was a huge telpher trestle. A four-tier combined charging and discharging machine was noted in operation, and a three-tier machine which had been built as a repeat order. Considerable interest was shown by the visitors in these super-grade productions, which have earned for the firm a high reputation. All the gearing of the machines is machine-cut. In the electrical shop the controls for the machines are fixed, and also all the other work in connection with the electrical equipment. Undoubtedly one of the finest things seen was the high-speed saw, which dealt with iron joists 10 in. by 5 in., sawing off pieces into desired lengths at a great speed. One of these joists was cut in 33 seconds. The saw makes 32,000 revolutions per minute, and it takes ten minutes for it to stop when the current has been switched off. A battery of drills for girder work and a girder-bending machine were seen working.

Subsequently the visitors returned to the Ovenden Works, where the firm's motor vehicles were inspected. A very useful service was referred to as being supplied by the "Express Service" lorry, a vehicle having the speed of a high-grade car, which is kept in readiness for emergency in any part of the country. On the receipt of a message, the lorry can be loaded with equipment up to a ton in weight, together with the necessary breakdown gang, and dispatched at very short notice day or night wherever needed. Various examples of the service rendered in this way were quoted, where plant (not necessarily of the firm's construction) had become out of order, and immediate attention was imperative. The fireproof drawing office, time office, corresponding department, &c., were passed through before the members assembled outside the offices to be photographed.

Adjourning to the reception room a substantial tea was provided by the firm. After tea,

THE PRESIDENT said they were all very much indebted to Messrs. Drake, Mr. Thompson, and the other members of the staff who had conducted them over the works, and to the workmen who had stayed there on a Saturday afternoon to show the machines in operation. They had all been greatly impressed by what they had seen, and he felt that the firm would have been amply repaid for the trouble and expense in connection with that visit by the very genuine interest of the visitors. The high-grade manufactures of the firm were well known to them all, and he remembered having seen in one of Messrs. Drakes' advertisements, some time ago, that "An engineer is known by other things than words." They had found this exemplified in what they had seen that afternoon; and the very large plant, the constructional detail, and the vast amount of new work in hand proved that the gas industry was in no sense decaying. It was only by the help and co-operation of manufacturers like them that the industry would continue to progress as it was doing.

Mr. R. N. WEBB (Leeds), proposing a vote of thanks to the firm, and to all who had in any way helped in making the visit so successful, said the occasion had been a revelation. They had witnessed the actual working operations in progress, and must all have added considerably to their knowledge. They had seen wonderful pieces of plant; and the high-speed saw, drill, &c., were fine examples of expert engineering. He would like to congratulate Messrs. Drakes on the excellent works they had been privileged to inspect.

Mr. H. L. BATEMAN (Wakefield), seconding the vote, remarked that the combined charging and discharging machines were fine examples of the firm's work. It was firms like that who, with all their experience, were forging ahead; and with their help the gas industry would be in a better position to cope with competition, and would in all probability at the same time be able to cheapen their commodity to the public.

Mr. G. DIXON said it was with pleasure that he supported the resolution, for he had thoroughly enjoyed the visit. It was an education to any junior. They had seen things which could not be seen on the gas-works, and which would be of great benefit to them in their every-day work. The well-lighted and well-constructed shops, the excellent and up-to-date machinery, and the complete organization of the whole undertaking had all proved of great interest.

Mr. M. T. THOMPSON, responding on behalf of the firm, said he must again refer regretfully to the unavoidable absence of Mr. J. Wilfrid Drake, who would have been delighted to be with them. They were glad to see the members of the Association, and also all the visitors. It was twelve years since the Association last visited the works, and he hoped it would not be so long before they came again. The members had seen in operation the portions of the plant which the firm thought would be of most interest, and this would give the members some idea as to the firm's capacity. They would also have realized the difficulties the firm had to contend with. They were not yet as up-to-date as they would like to be, and in twelve months' time hoped to have further improvements. They occupied 30 acres, and had room for extension. They were bounded on one side by the railway, from which they were constructing a siding direct into the works. There were now 44,000 sq. yds. of covered buildings, and they hoped to be able to double that amount, so that in this very variable climate all work could be carried out under cover, and thus obviate any delay that might have happened in the old days, when the weather had such a great deal to do with the keeping of a delivery promise. He referred to the express emergency wagon, and said that recently a call was received from South Wales one night at 9 o'clock, for some parts which could not be obtained locally. In sixteen hours from receipt of the message, the express lorry had delivered the parts and the men to fix them. It was one of their ways of giving good service, and he felt sure engineers would appreciate this when they realized that the firm were out to do the very best they could as expeditiously as possible. The employees numbered about 2000, in addition to the staff of 150, in which foremen were included. Included in the new work the firm had on hand was a total of 30,232 ft. of retorts, of which 8468 ft. were silica. This, converted to a carbonizing plant, would be equivalent to one of 2266 tons capacity, or 30 million c.ft. per day. Regarding the combined stoking machine which the members had seen, the firm could, if necessary, turn out one in about three weeks; and when the number of moving parts and fitting work to be done were taken into consideration, he felt sure the members would agree that the time was short. The firm were always pleased to have visits from such Associations, and at any time would be glad to see the members again.

The Billingham Ammonia Plant.—In describing the factory for making ammonia from the nitrogen of the atmosphere, now at work at Billingham, on the banks of the Tees, the "Times" last Friday said that it deserves to be regarded not only as a noteworthy achievement of British engineering, but also as an important contribution to the security of the country. This plant, near Stockton-on-Tees, has been in full operation since the commencement of the year. Already the daily output, in the form of sulphate of ammonia, is from 100 to 120 tons, and it is to be doubled immediately; while the buildings and equipment, which stand on a site having an area of 900 acres, are so planned as to be capable of much greater expansion. After study of the various processes, it was decided by Synthetic Ammonia and Nitrates, Ltd., that the most suitable would be one based on that of Haber, but modified in important respects. The next step will be the establishment of a plant for the oxidation of ammonia to nitric acid, with the object of making ammonium and other nitrates. The erection of plant for the manufacture of other ammonia products, including urea, is also under consideration.

GASEOUS COMBUSTION AT HIGH PRESSURES.

PART IV.—THE INFLUENCE OF VARYING INITIAL PRESSURES UPON THE RATE OF PRESSURE DEVELOPMENT AND THE ACTIVATION OF NITROGEN IN CARBON-MONOXIDE-AIR EXPLOSIONS.

By WILLIAM A. BONE, D.Sc., Ph.D., F.R.S., D. M. NEWITT, B.Sc., D.I.C., and D. T. A. TOWNEND, B.Sc., D.I.C. (Salters Research Fellow).

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(*Continued from p.* 603.)

INFLUENCE OF VARYING INITIAL PRESSURE UPON THE ACTIVATION OF NITROGEN BY THE RADIATION FROM BURNING CARBON MONOXIDE.

If, as we suppose, nitrogen can intercept and absorb the radiation emitted by burning carbon monoxide, with consequent increase in its own vibrational energy, it might be anticipated that the phenomenon would be influenced considerably by the degree of initial compression under which the $CO + O_2 + N_2$ mixtures are exploded; for the greater the density of the nitrogen in the explosion chamber, the greater would be the chance of its intercepting the radiation in question. Indeed, it might also be expected that there would be some limiting compression below which the phenomenon would hardly be discernible; and that the more the initial compression is increased above such limit, the greater would be the resulting effect. The following experiments will show how completely such anticipations have been fulfilled.

In these experiments a normal carbon-monoxide-air mixture ($2CO + O_2 + 4N_2$) was successively fired in the bomb at initial pressures of 3, 10, 25, 50, 75, and 100 atmospheres respectively, and the resulting pressure-time records carefully analysed. And, for comparative purposes, a parallel series of experiments was also carried out with an isothermic $2CO + O_2 + 4O_2$ mixture at corresponding initial pressures, except at 100 atmospheres, where it was feared that the violence of the explosion might be too much for the strength of the bomb.

In order to bring out as clearly as possible the true significance of these important results, we have tabulated them (Table V.) in adjacent vertical columns for each of the two isothermic mixtures, $2CO + O_2 + 4N_2$ and $2CO + O_2 + 4O_2$, respectively, at each of the successive initial pressures. And, from what has been said in the earlier part of the paper, the following criteria will apply—namely, (1) the non-occurrence of "nitrogen activation" in any particular experiment with the CO-air mixture will be shown by a very close approximation between the t_m, the "corrected" P_m, and the rate of pressure-fall after t_m, respectively, for that experiment and the corresponding values found for the $2CO + O_2 + 4O_2$ mixture at the same initial pressure; (2) a primary "activation" of nitrogen without any secondary NO-formation in any CO-air experiment will be shown by a longer t_m, and a much slower rate of cooling thereafter, together with practically the same "corrected" P_m values, as compared with those obtained in the corre-

TABLE V.—*Experimental Results with* $2CO + O_2 + 4N_2$ *and* $2CO + O_2 + 4O_2$ *Mixtures at Varying Initial Pressures.*

P_i (atmos.)	3		10		25		50		75		100
Experiment No.	40	41	42	43	44	45	3	9	46	47	48
$2CO + O_2$ diluted with	$4N_2$	$4O_2$	$4N_2$	$4O_2$	$4N_2$	$4O_2$	$4N_2$	$4O_2$	$4N_2$	$4O_2$	$4N_2$
t (secs.)	0·07	0·06	0·10	0·045	0·15	0·01	0·19	0·005	0·30	0·005	0·45
P_m obs.	21·4	22·8	75	77	193	215	409	460	635	760	880
P_m corrd.	23·4	24·1	80	80	209	215	440	460	682	760	..
Diffs. P_m corrd. $4O_2$ and $4N_2$	Negligible		*Nil*		6·0		20·0		78·0		..
P_i in 1 sec. after t_m	8·9	9·9	42·5	33·5	133	115	316	260	510	500	..
P_i fall in 1 sec. after t_m	12·5	12·9	32·5	43·5	60	100	93	200	125	257	..
P.ct. P fall in 1 sec. after t_m	58·4	56·2	42·5	56·5	31·1	46·5	22·75	43·5	19·7	33·8	..
P equiv. of exothermic effect in 1 sec.	*Nil*	*Nil*	10	*Nil*	17	*Nil*	64	*Nil*	40 to 50	..	..
Ratio P_m/P_i	7·13	7·6	7·5	7·7	7·7	8·6	8·2	9·2	8·5	10·1	8·8
T_i abs.	293°	293°	293°	292°	291°	292°	291°	291°	289°	290°	290°
T_m abs.	2435°	2600°	2565°	2625°	2615°	2930°	2785°	3120°	2832°	3412°	2975°

TABLE VI.—*Analyses of Pressure-Time Curves obtained with* $2CO + O_2 + 4N_2$ *and* $2CO + O_2 + 4O_2$ *Mixtures at Varying Initial Pressures.*

P_i (atmos.)	3		10		25		50		75		100
Experiment No.	40	41	42	43	44	45	3	9	46	47	48
$2CO + O_2$ diluted with	$4N_2$	$4O_2$	$4N_2$	$4O_2$	$4N_2$	$4O_2$	$4N_2$	$4O_2$	$4N_2$	$4O_2$	$4N_2$
Time in Seconds.	Pressures in Atmospheres.										
0·000	3	3	10	10	25	25	50	50	75	75	100
0·005	..	..	..	..	..	..	..	460*	..	760*	..
0·010	..	..	..	..	..	215*	..	..	..	..	..
0·045	..	..	..	77*	..	..	..	..	..	..	..
0·050	15	22·6	45	77	48	201	110	433	105	732	120
0·060	..	22·8*	..	..	..	..	..	..	..	..	..
0·070	21·4*	..	..	..	..	..	..	..	..	..	..
9 100	21·2	22·3	75*	75	105	187	206	412	175	700	170
0·150	20·3	21·0	73	71	191	182	350	393	275	680	250
0·155	..	..	..	..	193*	..	..	..	..	..	..
0·190	..	..	..	..	..	..	409*	..	..	..	..
0·200	19·0	19·5	71	67	191	177	409	376	420	665	370
0·250	17·9	18·4	69	64	188	170	408	360	585	650	490
0·300	16·9	17·3	67	62	183	160	402	350	635*	636	650
0·400	15·3	15·6	63	57	179	151	390	330	626	610	870
0·450	..	..	..	..	..	..	..	..	..	..	880*
0·500	14·0	14·4	58·5	52	169	142	380	311	608	590	880
0·600	13·0	13·4	55·5	48	161	135	370	299	602	563	865
0·700	11·9	12·5	53	44	154	131	361	287	585	551	850
0·800	11·0	11·5	50	41	147	127	352	276	569	538	820
0·900	10·3	10·8	46·5	38	143	124	343	268	557	524	800
1·000	9·5	10·3	44·5	35	139	120	334	259	545	503	780
Percentage fall in 1 sec. after t_m	58·4	56·2	42·5	56·5	31·1	46·5	22·75	43·5	19·7	34·2	..

* Denotes attainment of maximum pressure.

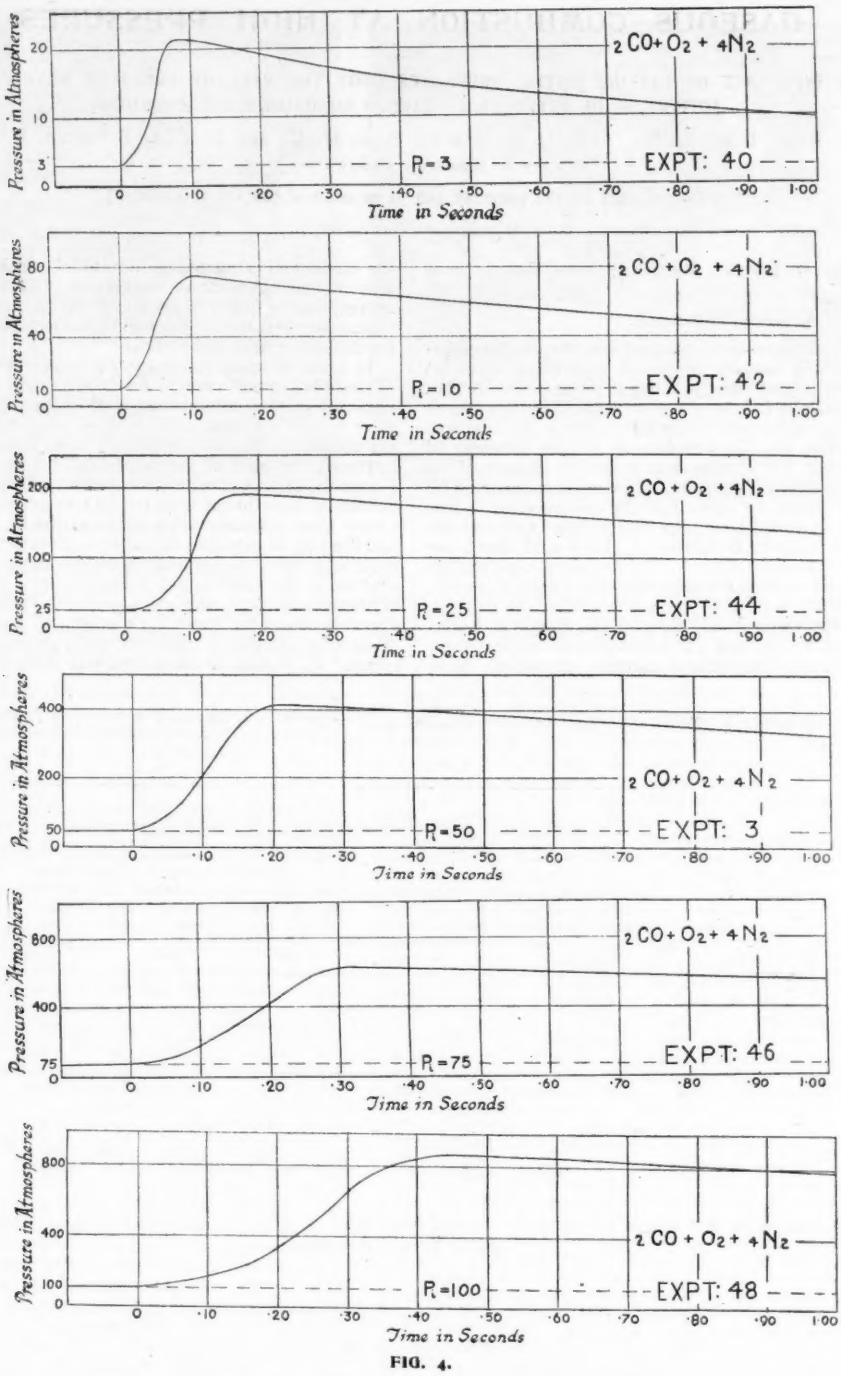


FIG. 4.

sponding $2CO + O_2 + 4O_2$ experiment at the same initial pressure; while (3) a secondary formation of nitric oxide superposed upon a primary N_2-activation in a CO-air experiment will be shown by a decidedly lower "corrected" P_m, as well as by a longer t_m, and a much slower rate of cooling thereafter, than in the corresponding $2CO + O_2 + 4O_2$ experiment at the same initial pressure. In figs. 4 and 5 are reproduced all the pressure-time records for the $2CO + O_2 + 4N_2$ and the $2CO + O_2 + 4O_2$ series, respectively, and it is important that they should be carefully compared. The curves are analysed in Table V.

The outstanding general feature of the results is that, whereas in the $2CO + O_2 + 4O_2$ series t_m progressively diminished with increasing initial pressure (thus agreeing well with the corresponding observations with the $2H_2 + O_2 + 4N_2$ and $2CO + O_2 + 4Ar$ mixtures), in the $2CO + O_2 + 4N_2$ series it increased with the initial pressure—*e.g.*, from 0·07 seconds at 3 atmospheres, to 0·19 seconds at 50 atmospheres, and to no less than 0·45 seconds at 100 atmospheres, with corresponding intermediate values. All this is entirely conformable with our theory of nitrogen activation in such cases.

Turning now to the individual experiments, it will be seen that:

(1) *With* $P_i = 3$ *atmospheres*, the practical identity between the t_m's, P_m's (corrd.), and the rates of pressure-fall after t_m, in the two corresponding $2CO + O_2 + 4N_2$ and $2CO + O_2 + 4O_2$ experiments are proof that no appreciable N_2-activation had occurred in the CO-air experiment. This is why it may be doubted whether Dr. F. Hausser obtained any N_2-activation in our sense in the CO-air experiments cited by him (*loc. cit.*) where the initial pressure was only 3·5 atmospheres.

(2) *With* $P_i = 10$ *atmospheres*, there was unmistakable evidence of some incipient N_2-activation in the CO-air experiment; for in addition to t_m having been prolonged to 0·10 sec., there was also a decided retardation of the rate of cooling after t_m as compared with the corresponding $2CO + O_2 + 4O_2$ experiment, without there being any appreciable difference between the "corrected" P_m values in the two cases. Undoubtedly, therefore, the primary N_2-activation had not been accompanied by any appreciable secondary NO-formation.

(3) *With* $P_i = 25$ *atmospheres*, the primary N_2-activation in the CO-air experiment was still more marked than in (2), and it was now apparently associated with some incipient secondary NO-formation.

(4) *With* $P_i = 50$ *atmospheres*, the primary N_2-activation in the CO-air experiment had considerably increased, and was again associated with some secondary NO-formation.

(5) *With* $P_i = 75$ *or* 100 *atmospheres*, it is evident that the primary N_2-activation in the CO-air experiment had now become so intense as to produce a considerable secondary NO-formation in the flame.

In fig. 6 are plotted, all to the same scale, the portions of each cooling curve for 1 sec. after the attainment of P_m, for both the $2CO + O_2 + 4N_2$ and the $2CO + O_2 + 4O_2$ series respectively.

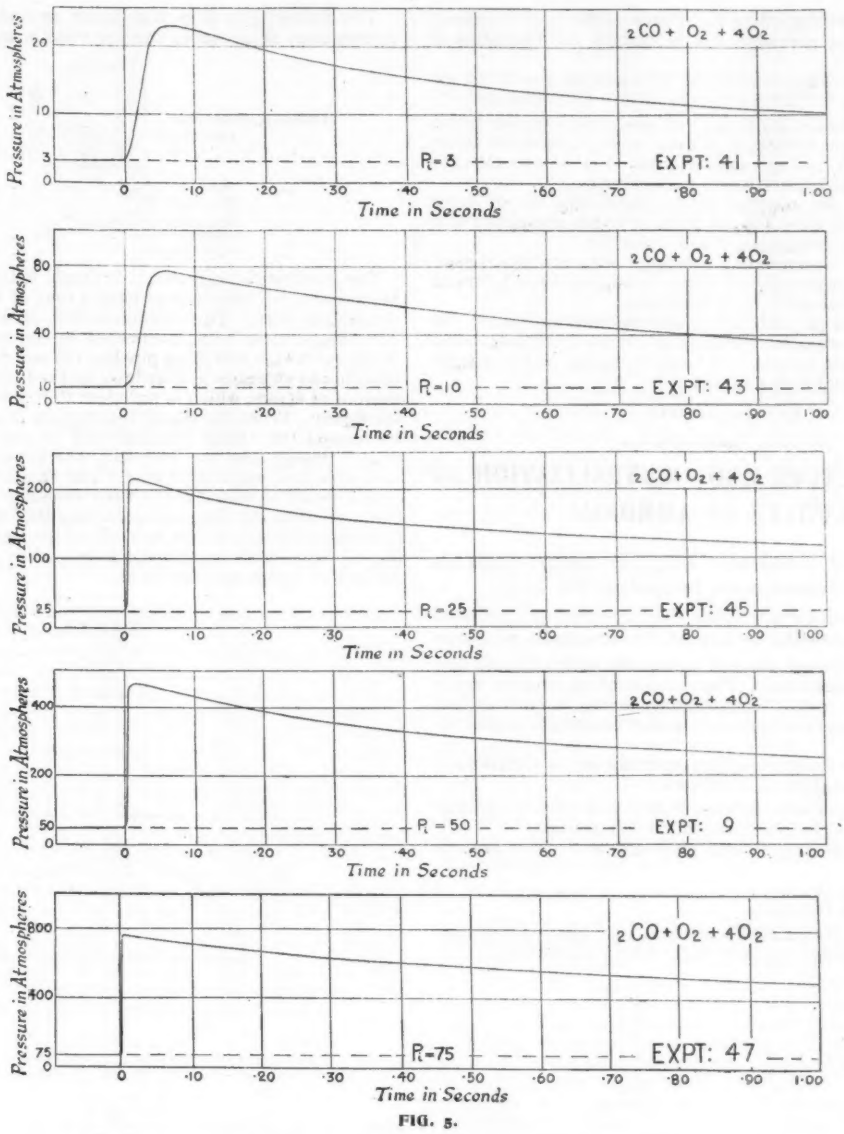


FIG. 5.

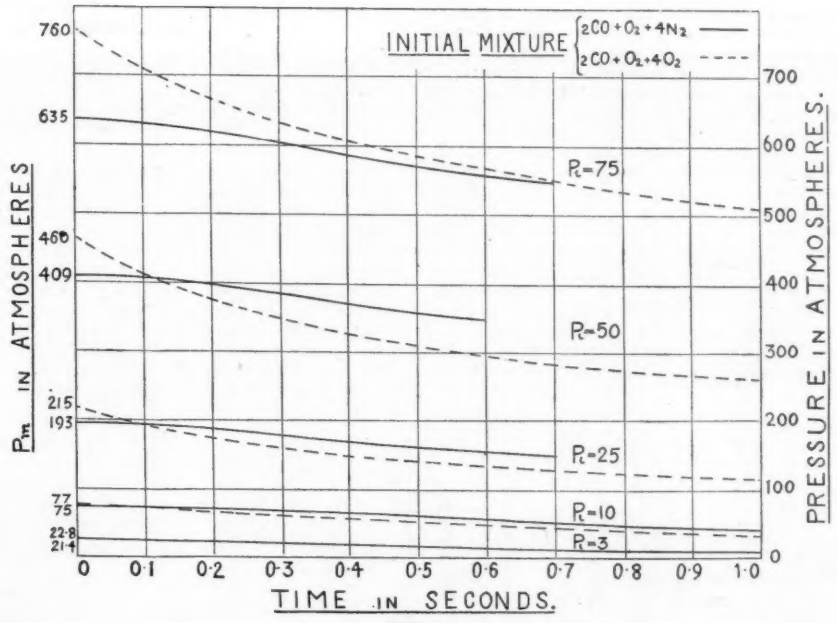


FIG. 6.

With $P_i = 3$ atmospheres, the two curves are indistinguishable, showing that in the CO-air explosion the nitrogen had acted merely as a diatomic diluent. With $P_i = 10$ atmospheres, there is a discernible difference between them, showing an incipient N_2-activation in the CO-air explosion. At higher pressures the difference becomes more and more marked as the pressure rises.

It is important to note that in each of the two CO-air explosions when $P_i = 25$ or 50 atmospheres, the magnitude of the exothermic effect observed during the first second of the "cooling period" after t_m exceeded by almost three times the amount by which the "corrected" P_m was diminished during the actual explosion period, as compared with the corresponding $2CO + O_2 + 4O_2$ ex-

periments. This we regard as conclusive evidence of a primary N_2-activation having preceded any secondary NO-formation in the explosions.

From the results taken as a whole, we conclude that in the explosion of a normal CO-air (*i.e.*, $2CO + O_2 + 4N_2$) mixture:

(1) There is a certain limiting initial pressure, somewhere between 3 and 10 atmospheres and probably nearer the latter, below which no appreciable activation of the nitrogen occurs, it acting merely as a diatomic diluent.

(2) Activation of the nitrogen is just discernible at an initial pressure of 10 atmospheres, but is at first unassociated with any appreciable secondary NO-formation.

(3) The primary N_2-activation increases with the initial pressure and is eventually (at about 25 atmospheres) followed by a partial secondary NO-formation.

(4) With an initial pressure of 75 atmospheres or higher, the primary N_2-activation becomes so intense that it is followed almost instantaneously by a large secondary NO-formation during the combustion period.

(*To be concluded.*)

THE MANUFACTURE AND NEUTRALIZATION OF SULPHATE OF AMMONIA.

[A Paper read by Mr. C. Bateman, F.C.S., of Cardiff, before the Wales and Monmouthshire Institution—May 28.]

Sulphate of ammonia is one of the chief bye-products obtained from the destructive distillation of coal. The formation primarily depends upon the nitrogen content in the coal, which, though very small, is of great importance. The percentage of nitrogen in the original coal varies from 1 to 3 p.ct. only, being least in anthracite. The average gas-making coal in this country contains approximately 1·5 p.ct.

In the process of carbonizing, the splitting-up or distribution of the total nitrogen might be as follows:

15 p.ct. is evolved as ammonia (equivalent to a yield of approximately 30 to 35 lbs. of nitrogen per ton of coal).
5 p.ct. forms hydrocyanic acid, pyridine, and other organic compounds.
30 p.ct. appears in the gas.
50 p.ct. remains in the coke.

I submit a typical elementary analysis of a gas-making coal, to compare the nitrogen content with other constituents:

	P.Ct.
Carbon	80·0
Hydrogen	5·5
Oxygen	8·8
Nitrogen	1·5
Sulphur	0·8
Ash	3·4
Volatile matter	30 to 35
Calorific power	14,400 B.Th.U. per lb.

The ammonia recovered represents approximately 12 p.ct. of the original calorific value of the coal. If all the nitrogen could be converted to sulphate of ammonia, a coal with (say) 2 p.ct. of nitrogen would yield 215 lbs. of sulphate per ton. In practice a yield of 27 to 28 lbs. per ton is usual. The conversion of nitrogen to ammonia in carbonizing is increased considerably by the aid of steam, as in various types of vertical retort installations.

The first step is the recovery or extraction of the ammonia from the gas, which is done primarily by condensation; while further extraction is greatly simplified by the great affinity between ammonia and water, which is capable of absorbing approximately 780 times its own volume of ammonia gas. This agent is usually employed in combination with some mechanical means of scrubbing the gas, such as washer-scrubbers, &c. The liquor obtained, which is a solution of ammonium compounds in a volatile and fixed state, is then stored, preferably in an overhead tank, and supplied by gravity to the chemical works for treatment and conversion to sulphate of ammonia; the principle being, of course, to distil ammonia gas, which is arrested in strong sulphuric acid.

The following is a typical liquor analysis, showing the usual combination of ammonia and the volatile and fixed content:

	Grammes per Litre.
Volatile.	
Ammonium sulphide	3·03
,, carbonate	39·16
Fixed.	
,, chloride	14·23
,, thiocyanate	1·80
,, sulphate	0·19
,, thiosulphate	2·80
,, ferrocyanide	0·41

The plant at Grangetown is Wilton's pattern (fig. 1), consisting of two sets, capable of producing 4 tons of sulphate of ammonia per set per diem. The reaction in the still will be easily followed. The liquor, after being preheated by hot waste gases from the plant, enters the still along pipeline (A) and flows downwards from chamber to chamber at overflows marked (B), meeting an upward current of steam, which is sufficient to free the volatile content of the liquor. When the liquor reaches the lower half, which might be termed the "fixed still," instead of continuing its downward flow, it passes into the lime still, wherein it is thoroughly mixed with excess of hot milk of lime. The object of using milk of lime is completely to volatilize the fixed ammonia content. The liquor then re-enters the still, and continues its downward course until, reaching the last chamber, it is run off through an automatic valve (fig. 2), which is so constructed as to release the spent liquor without loss of steam and ammonia.

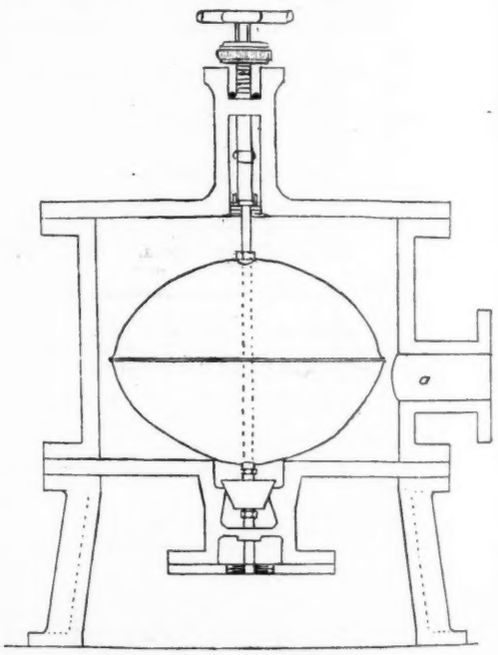


Fig. 2.—Wilton Spent-Liquor Valve.

A few details as to the working of the valve may here be of interest. As the liquor enters the valve at *a*, the float *c* rises and lifts the valve off its seating, allowing the spent liquor to pass out. Immediately the liquor leaves the pot, the float falls, the valve closes, and the cycle is repeated. In actual practice the float automatically takes up a position which allows the waste liquor to run away freely. The valve will operate with any pressure on the inlet. The milk of lime, which is made up by slaking the lime with hot waste liquor, is fed into the lime still by an automatic pump, operating on the float principle (fig. 3). The milk of lime enters the pump and fills the pot, causing the float to rise. As the float rises it automatically opens the steam valve, and the

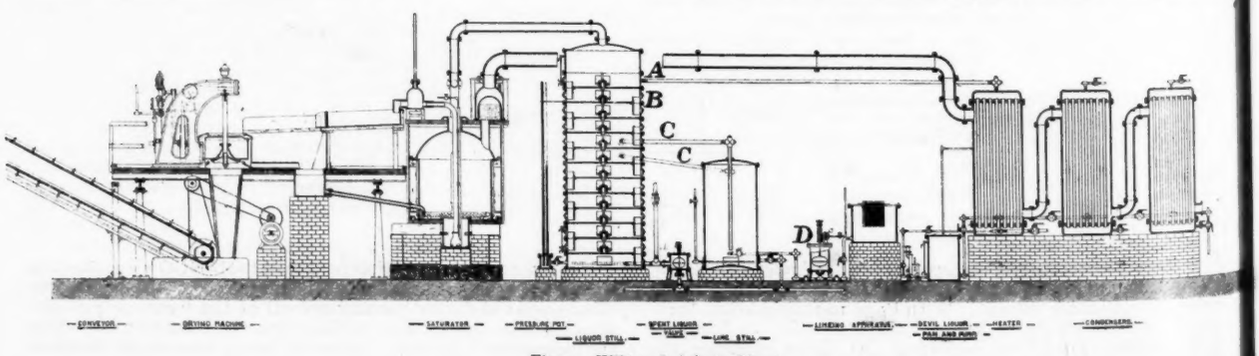


Fig. 1.—Wilton Sulphate Plant.

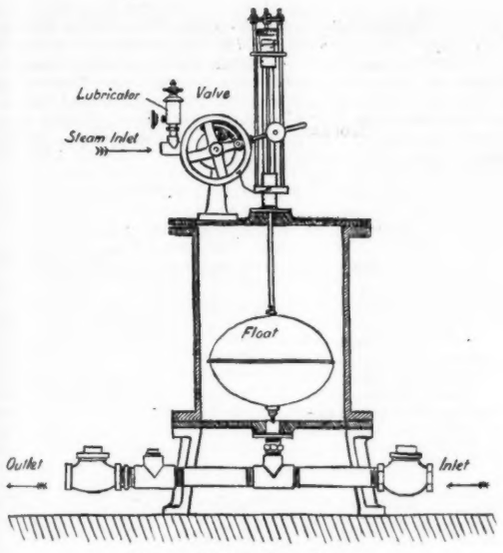


Fig. 3.—Wilton Lime Pump.

force of steam entering the pot blows the lime out. A non-return valve is fitted on the inlet and outlet.

The ammonia gases, on leaving the still, pass along a cast-iron pipe into the saturator, which derives its name from the fact that here the sulphuric acid is saturated with ammonia gas. The usual form of saturator is known as the closed type. The ammonia or "cracker" pipe divides into two as it enters the saturator, each section running to the bottom, and branching out into a semi-circular path, making practically a complete circuit of the base. Each branch is drilled with a series of small holes which ensure an efficient distribution of the ammonia gas through the saturator. The gas, on coming into contact with the sulphuric acid, combines with it to form sulphate of ammonia, which collects in a suitably constructed well in the base of the saturator. It is then ejected, together with mother liquor, on to the draining table, by means of a steam ejector. The salt here may contain anything up to 3 p.ct. of acid. The mother liquor is then drained off, and the salt pushed from the draining table into a perforated centrifugal whizzer. The latter is revolved at 600 r.p.m.; the force set up being sufficient to remove excess moisture and acid. The salt would then have a specification roughly as follows:

	P.Ct.
Ammonia	24·75 to 25
Moisture	up to 2
Free acid	0·3

It may here be stated that the condensation from the waste gases of the plant (devil liquor) are re-circulated with the liquor, to minimize ammonia losses. The percentage of ammonia in the waste liquor is maintained under 0·01 p.ct.

Up to a few years ago the production of a neutral dried variety of sulphate of ammonia was confined to only a few plants; but a steadily increasing demand for this salt has made its manufacture a thing of necessity and import. There are various methods of neutralization in present-day use, and I will outline the chief ones.

Neutralization by Means of Caustic Soda Solution.

This method is carried out by spraying the salt with caustic soda in solution, the amount required being arrived at as follows:

Weight of fugal . . . . . 3 cwt.
P.ct. of free acid before neutralizing 0·2
Weight of acid to be neutralized . 0·2 p.ct. of 3 cwt., or 0·672 lbs.

$$\text{Weight of caustic soda to neutralize 0·672 lbs.} = \frac{80}{98} \times 0{\cdot}672$$
$$= 0{\cdot}55 \text{ lbs. approx.}$$

An amount of caustic soda slightly in excess of this figure has to be used to ensure complete neutralization; and this excess, on account of its strong basic action, tends to the evolution of ammonia from the salt. This reaction, together with the additional weight of sodium salts formed as a product of neutralization, naturally reduces the ammonia content of the salt, and is the great drawback of this method The following are average results obtained over a considerable period.

	P.Ct.
Free acid after washing and before neutralizing	0·21
Free acid after neutralizing	*Nil*
Moisture	0·21
Ammonia	24·80

Neutralization by Means of a Solution of Soda Ash.

This is done in identically the same way as the caustic soda method, and has the same drawbacks, though here the evolution of ammonia is perhaps not so great. Dry soda ash can also be used for neutralizing in conjunction with the dryer, and there is on the market a combined dryer and neutralizer of this pattern. The machine is built of specially designed cast-iron round sections, with removable trays forming the steam jackets. Distributing arms are fitted to each tray, which convey the salt alternatively from the centre to the periphery, and *vice versa*; gas and moisture outlets being fitted to each tray. A feeding hopper is provided for the salt, and a smaller one for the soda ash.

Neutralization by a Solution of Ammonia.

In this method (which is the one at present in use at the Grangetown Works of the Cardiff Gas Light and Coke Company) four gallons of a 0·5 p.ct. ammonia solution are used to neutralize one fugal, or 3 cwt., of sulphate of ammonia; the neutralization taking place in the centrifugal dryer. The ammonia is made up by subjecting a mixture of sulphate of ammonia and lime to steam distillation, and collecting the products of distillation in a small storage tank. This concentrated ammonia is then run into a large mixing tank, and made up to 0·5 p.ct. strength, and from this tank is drawn as required into a pot holding exactly four gallons. This neutralizing solution is then forced from the pot by air pressure (2 lbs. per sq. in.) and distri-

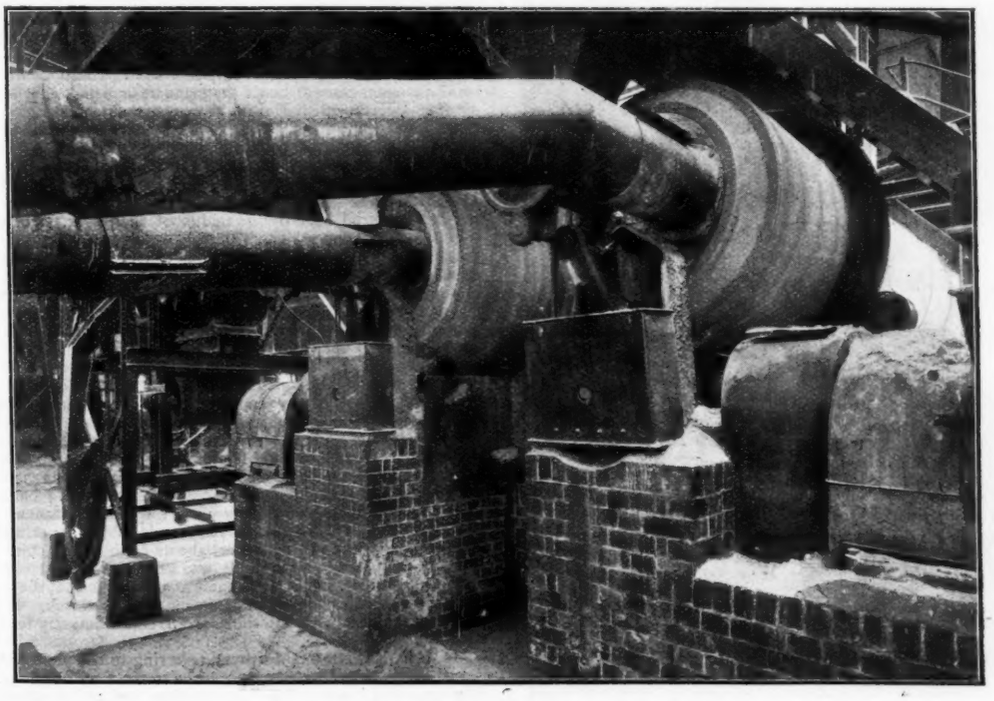


Fig. 4.—Holmes' Rotary Dryer and Neutralizer.

buted over the salt in the slowly revolving fugal. The amount of ammonia required is arrived at as follows:

Weight of fugal	3 cwts.
Free acid before neutralizing	0·2 p.ct. approx.
Weight of acid to be neutralized	0·2 p.ct. of 3 cwt. = 0·672 lbs.

Weight of ammonia to neutralize 0·672 lbs. of acid $= \frac{34}{98} \times 0{\cdot}672$ $= 0{\cdot}233$ lbs. NH_3, which is equivalent to just under 1 lb. of sulphate of ammonia.

In all cases of neutralization in the centrifugal, the salt is first washed with hot water, the object being to wash out as much of the excess acid as possible, and to reduce the amount of neutralizing solution required.

It has even been attempted to neutralize the salt by using hot water alone. A series of experiments at Grangetown, however, has shown this to be unsatisfactory, and my own opinion is that the acid salt (ammonium bisulphate) is formed in manufacture, and it is theoretically and practically impossible to wash out this acid radical. Even if it were possible, the amount of salt lost during washing would be so great as to make this method unpractical.

The disadvantages of neutralizing with ammonia solution are:

1. Corrosive action of ammonia on the copper baskets, linings, and spindles.
2. The formation of rock salt in the saturator, on account of running back the excess neutralizing solution.

It might here be worthy of note that at some works the weak ammonia solution is used to neutralize the salt when it is actually in the tray. I gather, however, that this method is at present usually unreliable. Gaseous ammonia is also used; and this method has been adopted by the Gas Light and Coke Company, at their Beckton Works. The plant consists of a rotary dryer inside which is a series of arms or blades which pick up the salt and turn it as it passes along the cylindrical casing. Furnace gases and gaseous ammonia are admitted at the outlet of the dryer, and passed along in the opposite direction to the travel of the salt. The latter, after traversing the neutralizer, is passed over a screen, and any lumps still remaining are carried forward into a small grinding mill. Figs. 4 and 5 illustrate this plant.

The writer would like to state that, owing to the wide field of the subject, it has been impossible to do more than generalize. Here a few personal notes might be opportune, as there are several details of working, which, if carefully followed up, tend to give better results. We have found that efficient liming and spraying are essential factors; and by using a Korting's atomizer for hot-water spraying, and a specially-constructed wide-mouthed spray for the ammonia solution, it has been possible to ensure a sufficient distribution of liquid, both over and through the mass of the salt. This is additionally safeguarded by turning the salt in the fugal. In cases of neutralizing with basic solutions, the salt has to be dried separately; and in our case a Wilton's dryer is employed, which is quite satisfactory. It is not advisable to store the salt before drying, as we have found that a neutralized undried product tends to acidify. This phenomenon is possibly due to the combination of a weak base (NH_3) and a strong acid (H_2SO_4), dissociation taking place in the presence of moisture.

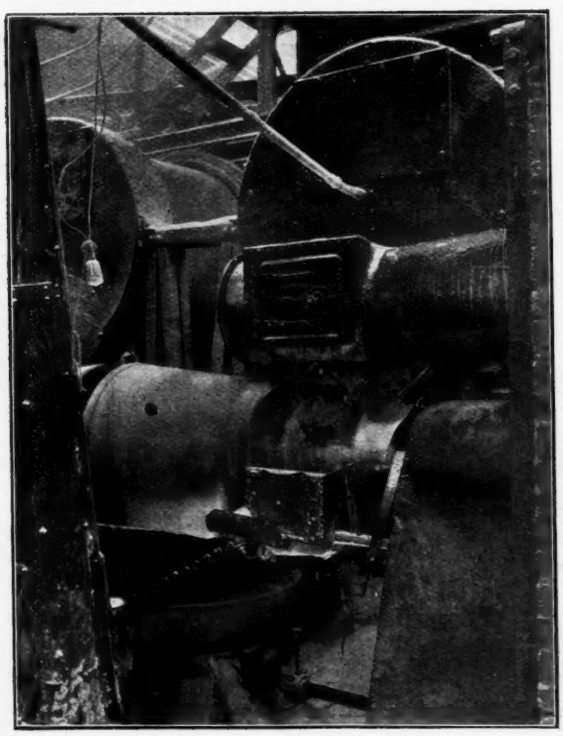


Fig. 5.—The Screen and Grinding Mill at Work.

In conclusion, in spite and because of the untiring research and enterprise of those connected with the industry, there is still a wide field for further improvement. It is to be hoped that a continued consideration and application of chemical and physical detail will do much to put the manufacture of this bye-product in its proper station in the gas industry.

SPECIMEN DAILY WORK SHEET.

SULPHATE OF AMMONIA MANUFACTURE.

Date—May 1, 1924.

Hours plant worked, 24. Number of men employed, 4.

Ammoniacal Liquor—	
Quantity received from storage well	12,107 gallons
Wills test	8·53 oz. str.
10 oz. liquor converted	10,347 gallons
Sulphate of Ammonia—	
Theoretical yield	3 tons 18 cwt.
Quantity made	3 tons 16 cwt.
Percentage of NH_3	25·63
Free acid	*Nil*
Moisture	0·11
Fugals	No. 1. 23. 7.8.8. No. 2.
Bags	No. 1. 38. 12.13.13. No. 2.

MANUFACTURING MATERIALS USED.

Sulphuric Acid—	
Specific gravity	1·687 (Tw. 138°)
Percentage of H_2SO_4	75·30
Gallons	523
Weight	3 tons 17 cwt.
Theoretical amount required	3 tons 16 cwt.
Lime—	
Weight	13 cwt.
Percentage of CaO	92
Theoretical amount required	11 cwt.
Effluent liquor test	·008

STOCKS.

Sulphate of ammonia	21 tons 3 cwt.
Sulphuric acid	52 tons 6 cwt.
Lime	7 tons 10 cwt.

SALES.

Sulphate of ammonia	25 tons

DELIVERIES.

Sulphuric Acid—	
Weight of acid tanks	9 tons 2 cwt.
Number of tanks	1
Tank numbers	53
Lime—	
Weight of lime delivered	— tons — cwt.
Truck numbers	*Nil*

Discussion.

The PRESIDENT (Mr. W. Clark Jackson, of Neath) remarked that the excellent series of lantern slides by which the paper had been accompanied had been of great assistance in enabling the members to follow the subject-matter. The refinements of sulphate of ammona manufacture were not always applicable to the smaller works. Those works which were running 1-ton or 2-ton plants were seldom in a position to secure the same results as those controlling plants of 4 tons capacity and upwards. At the same time, sulphate of ammonia as a bye-product was worthy of attention, because, of course, all that they could get back from bye-products helped them to reduce the cost of their gas. It was somewhat striking to note the great disparity between the actual amount of sulphate which could be obtained, if the total nitrogen content could by some means be recovered, and (say) 27 lbs.—which, with South Wales coal, was a pretty high figure. With some of the Scotch coals, it was quite possible to attain 35 or 36 lbs. of sulphate per ton, and sometimes even more. In the case of South Wales coal such as most of the members were dealing with, if they could get about 20 lbs. they felt that they were doing well. Then there was the question of the cost of manufacture, which had not been entered into by the reader of the paper. For several years it had taken them all their time to make sulphate production on a small scale pay its way; and he was not giving away any secret when he said that in the case of some of the smaller works the ammoniacal liquor had been thrown or given away. This was a state of affairs which should not exist. The liming apparatus described by the author certainly seemed to give excellent results at Cardiff; but there again, the smaller works might well hesitate to make even an addition of this character to their plant. The same applied to the question of neutralization. If they could be given some means of neutralizing which was going to pay from the point of view of the small works, every manager would be ready to take advantage of it; but if plants were to cost (say) £300 to £350 for neutralizing a ton a day, the extra return so secured was not likely to pay reasonable interest on the capital outlay. One thing which had struck him in connection with the paper was the daily work sheet; he was a big believer in daily reports of this kind. If rightly used, they formed an excellent means of keeping the driving reins in the hands of the superintending head. Coming in regularly, such report sheets enabled the chief to maintain a check upon the working. It was very gratifying to have a young member like Mr. Bateman reading a paper, and they were much obliged to Mr. Madden for allowing him to do so. It was further proof of the interest that the Cardiff Gas Company took in the Institution.

Mr. J. E. KENSHOLE (Merthyr), referring to the yield of sulphate per ton of coal, said the author put this at from 27 to 28 lbs., while the President had just expressed his opinion that 20 lbs. was a good result from South Wales coal. He agreed that this was quite as high as might generally be expected from such coal. A good many years ago

he manufactured sulphate of ammonia, but twenty years had elapsed since it was given up, because the space occupied by the plant (which was not an up-to-date one) was needed for a water-gas set, owing to the congested state of the old works. At that time about 18 lbs. of sulphate per ton of coal was the average; he did not recollect ever getting up to 20 lbs. He was, of course, speaking now of horizontal retort working; with verticals more of the ammonia was usually recovered. Did the author think that, carbonizing South Wales coal in horizontal retorts, 27 or 28 lbs. of sulphate per ton could be obtained? Mr. Bateman pointed out the importance of the liming process, and with this he agreed; but the Cardiff plant provided this milk of lime automatically. In the case of his (the speaker's) own old plant, they were dependent upon a hand pump, and no doubt occasionally the stuff was not put in as regularly as it should have been. There was no neutralizing at that time, and 22 p.ct. ammonia was as high as they could manage. The whole thing came down to the question of whether it was going to be a paying proposition to carry on the manufacture and neutralization of sulphate in the smaller works. Of course, they must get rid of their ammoniacal liquor, and there were some works not in a position to send it away even carriage free. In view of the large installations on the Continent for the production of synthetic ammonia, he very much doubted whether the manufacture of neutral sulphate would be a paying proposition for small works at the present time—especially bearing in mind the high prices of the plant. He would like to hear something on this point, though he appreciated that whether it was a paying proposition or not, did not affect Mr. Bateman's paper.

Mr. F. L. RUST (Newport) said he had had some experience with a rough and ready plant. Unfortunately the contractor who had been in the habit of taking their liquor found that he could no longer operate his plant so as to make a profit. So his Company had to take on the work, because they were forced to get rid of the liquor. They started off by making ordinary salt with a very old form of plant; but so far as they could see, the trend of the market was for the neutral quality. The great question was whether it paid to make this neutral quality. Of course, it was necessary to meet the buyers' demands; but the extra price they got for selling as a neutral salt in a friable condition did not seem to work out to the advantage of the gas industry.

Mr. H. D. MADDEN (Cardiff) said the work to which the paper had reference was Mr. Bateman's own. Ever since he came from Beckton he had specialized in sulphate manufacture, because at the time of his arrival at Cardiff they had just changed over from ordinary salt to neutral salt, and they had difficulties, as was the case with every new process. This paper was really the outcome of a very close study which Mr. Bateman had made of the subject over the past sixteen months. They lost Mr. E. H. Clarry, and Mr. Bateman took his place. Members had asked: Is it worth it? Well, it was. He did not care what section of plant it was, it paid to specialize on it. This was so, even in the case of small works. With his Company, who had to ship large consignments of sulphate, it was necessary that this sulphate should be in such a condition that the bags could be handled satisfactorily. They might have to be stored three or four weeks before the ship took them away, and then perhaps there was a five or six weeks' journey. With ordinary salt, before the bags got to the ship some of the bottoms would fall out, owing to the action of the acid, and by the end of the journey the state of things was worse. With neutral salt this did not occur, and the demand was for neutral dry salt. This was not only on account of the better condition of the bags; when the sulphate was used in agriculture, the fine dry crystals were more efficacious. It paid to watch things very closely even on a small works. If they wanted cheap gas, it was only by looking after details and getting the very best out of their raw material that they could hope to do so. The percentage of ammonia depended upon the acid to some extent. Acid prices were too high to-day, but they could cure this if they combined. They supplied the raw material in the shape of spent oxide, and they could put down plants and supply their own acid from this. Mr. Bateman had mentioned the effect of neutralization on the wear and tear of the centrifuge. It would be useful if he could give them a little explanation of the chemical action causing this corrosion, and some suggestions as to how to overcome it. Again, could the author give them some idea of the difference in production of ammonia per ton of coal from verticals and from horizontal retorts, and what movement there was (if any) to try to secure a greater proportion of the nitrogen in the form of ammonia?

Mr. A. E. DAVEY (Aberdare) told the meeting that the paper had been particularly interesting to him, because he had had difficulty in getting rid of his ammoniacal liquor. From conversations he had had, he gathered that there were others in the same position. Could the author say what was the smallest size of works to which such a plant as he had described could be made applicable?

Mr. W. H. JOHNS (Swansea) said Mr. Bateman, in presenting this paper, had set an example which some of the younger members might well emulate. It really was up to the juniors now to come forward and give the results of the detail work carried out by them in their daily routine. The method adopted at Cardiff of presenting a daily work report to the responsible head was one upon which the Company were to be congratulated. It was really the only way in which to keep a tight hold upon the efficient working of any particular plant over which one might have control. The question of the ammonia yield had been raised, and as a newcomer to South Wales—having made 25 to 27 lbs. per ton, using best English coal—it was a very great surprise to find that in Swansea the yield was so low. A yield of 20 lbs. of sulphate per ton from Welsh coals was a result they would all like to obtain; but he thought it was really beyond them, and that they could congratulate themselves if they got 15 lbs. with the plants which were at their disposal at the present time. He had not had any experience in Swansea with steaming vertical retorts, but it must not be overlooked that getting this extra yield often meant a greater fuel account. If the ammoniacal liquor was of a weak nature, it cost more to work-up per ton of salt manufactured. With regard to capital expenditure, he believed—and he hoped later on to be able to substantiate it by figures—that in Swansea they hit upon a plant which would cost a very low figure to instal. He referred to Dr. Weyman's system as in operation at the works of the Newcastle-on-Tyne and Gateshead Gas Company. The use of steam was entirely done away with for drying the salt. The only thing needed was to add the neutralizing medium (costing 2d. or 3d. per lb.); and the extra cost of this was repaid time after time. As had been pointed out, the markets would be closed to their product in the future, unless they did neutralize. If the farmer could economize by adopting the dry sulphate method, he would adopt it rather than have his labourers working for a longer period on the wet salt. It was absolutely imperative that they should neutralize if this market was to remain open to them. In Swansea, they were helping at least one small undertaking to get rid of their liquor. This undertaking were in a very awkward position, where they could not run the liquor to waste, because they were near a very fine trout stream. Anyone else having difficulty in the disposal of his liquor might communicate with the Swansea Company, who were very well placed for shipment, and so would be pleased to give consideration to any offers that might be made of free supplies of liquor. With regard to the capital cost of the plant he had been referring to, which they were installing at Swansea to deal with 4 tons of sulphate a day, it would be less than £150. The salt was dried by a whizzer, and in passing from the base of the whizzer was allowed to drop a certain distance, and was then elevated. When it reached the head of the elevator, it had a drop of 20 ft., and in this process of dropping it was further dried. The salt was not broken up at all; the crystals were quite good, and found a ready market. The extra revenue obtainable from such a plant had convinced him that they were doing the right thing in neutralizing. No manager of a small works need have any fear of adding further worries to his lot by adopting this plant. For a 1-ton plant there should be a considerable reduction on the figure he had named. He hoped to be able to get as good results at Swansea as those which he saw when he visited the north of England.

Mr. E. ABLETT (Swansea) remarked that they had recently, since the change-over, been troubled by the Factory Inspector calling upon them to fix safety seals or safety valves on their plant. Had they in Cardiff been similarly called upon, and, if so, what had been done to meet the requirements?

Mr. BATEMAN, in the course of his reply to the points raised, said reference had been made to the high yield of sulphate in the case of Cardiff. Of course, they were carbonizing a good percentage of Yorkshire coal, which accounted for the greater yield. With regard to the profit on the working of the plant, he purposely had not introduced any figures, but he was quite sure they made a profit, and a very good one. As to the efficiency of the liming apparatus, this was a very strong point. They found that by keeping it up to the scratch the yield was considerably increased. The neutralizing plant was very simple, and the cost was exceedingly small. The daily report was actually the return that went to the engineer each morning. In answer to the question whether it was a profitable proposition for the smaller works to manufacture neutral sulphate of ammonia, he might say he had often thought that possibly a central station for the purpose might be arranged among these undertakings. In Yorkshire it was done, and by this means it was quite easy to make it a paying proposition. In neutralizing with ammonia solution, the ammonia had a corrosive action on the copper used in the plant, and, of course, there was a great deal more wear and tear on the plant when neutralizing than when making ordinary salt; but if they did not make a neutral salt they would have their stores full. They often had to store for shipping orders, and they had not had a single complaint of salt caking in the bags, whereas previously they did have some. He did not agree that in consequence of steaming they got weak liquor. With reference to the Factory Inspector, he had had no complaints from him in any respect. The waste gases were carried away and distributed through the oxide heaps by means of a hydraulic valve.

Mr. ABLETT said the Alkali Inspector made no complaints, but the Factory Inspector wanted a safety valve on the still itself.

Mr. BATEMAN replied that on the still itself there was no release valve, and it had not been asked for by the Inspector. A gauge glass ran the whole height of the still, and any pressure coming along was shown there immediately. The still was cleaned out about every three months (according to the time worked), and pressure was hardly ever experienced in working.

The Bland Light Syndicate, Ltd., Presentation.

A presentation was made on May 30 to Mr. Dudley C. Moreton, the Manager of the London Office, on the occasion of his retirement after fifty-two years active business life in the gas industry. The Chairman, Mr. F. J. Gould, presented on behalf of the Directors and staff, a handsome silver salver inscribed as follows: "Presented to Mr. D. C. Moreton by the Directors and Staff of the Bland Light Syndicate, Ltd., as a token of their affection and esteem, on the occasion of his retirement, May 31, 1924." Mr. Gould mentioned that Mr. Moreton's business life had been a record in many ways, and one of which his wife and family might well be proud. It conveyed a lesson which young business men of to-day might well emulate. Mr. Moreton had been absent from his duties through illness only five days during the fifty-two years service, three days of which had occurred during the last few months. Mr. Moreton, in thanking the Chairman, Directors, and staff for their presentation, stated that he was seventy years of age, had worked very hard all his life, and in consequence enjoyed good health; but he felt the time had come when he should take a well-earned rest and make room for younger men. Mr. Moreton, who was accompanied by his wife, was heartily congratulated by all the members of the staff of the Bland Light Syndicate, Ltd., who expressed their regret at losing him.

Lieut.-Col. Arthur H. Laybourne, J.P., who was a Director of the Newport (Mon.) Gas Company, left unsettled property of the gross value of £71,630, with net personalty £68,961.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

The "All-Gas" Kitchen at Arnolds'.

SIR,—Our attention has been drawn to your issue of May 14, p. 467, wherein a description is given of an "all-gas" kitchen at Messrs. Arnolds', Great Yarmouth.

The paragraph we take exception to is that in which a statement is made that "the whole of the equipment was supplied through the Great Yarmouth Gas Company, by Messrs. John Wright & Co. (members of Radiation Limited)." This is not correct, since the water-boiler, coffee-making machine, and egg poachers were supplied direct by this Company. Apart from this fact, your paragraph is liable to convey to the reader that our goods are manufactured and supplied by Messrs. John Wright & Co.

We should therefore feel obliged if you would be good enough to correct this statement and impression in your next issue.

83, *Kirkstall Road*,
Leeds, June 4, 1924.

JACKSON BOILERS, LTD.
A. E. BARROW, Director.

REGISTER OF PATENTS.

Treatment of Ammonia-Charged Gas.—No. 209,379.

KOPPERS COMPANY, of Pittsburg, Pa.

No. 3538; Feb. 6, 1923. Convention date, Jan. 2, 1923.

This invention consists broadly in combining an ammonia recovery process with the impurity removing operation claimed in specification No. 190,115 (see "JOURNAL" for Feb. 6, p. 318), in which a solution of a non-volatile alkali compound circulates between impurity absorption and revivification stages; the latter stage comprising heating the liquid under regulated pressure. A solution of sodium carbonate is used for absorbing the ammonia, hydrogen sulphide, carbon dioxide, and hydrocyanic acid; and prior to revivification, the absorbent is subjected to distillation, to remove the ammonia. The purifying liquid used may also be a suspension or solution of an alkaline-earth compound; and the present invention can be applied to an ammonia recovery process of the indirect or direct type.

The cooled gas, free from tar, is conducted from the tar extractor into the bottom of a scrubber, in which it is brought into contact with the absorbent. This solution absorbs some of the CO_2, together with most of the H_2S and NH_3. By having a scrubber of sufficient size, and employing the proper rate of circulation, all the NH_3 may be absorbed; but it is often preferable to conduct the treatment with Na_2CO_3 solution in a relatively small scrubber, and to complete the absorption of NH_3 with water in a second scrubber. The Na_2CO_3 solution employed may be of a strength to test about 15 p.ct total alkalinity calculated as Na_2CO_3.

In the subsequent treatment of the solution for the removal of NH_3, H_2S, and CO_2, heating is employed in a different sequence from that used in the process of the prior specification referred to. The NH_3 is expelled, together with approximately one-half of the H_2S, by heating the solution at atmospheric pressure. Some of the CO_2 comes off in this treatment. The solution is then heated under vacuum for the expulsion of the remainder of the H_2S. It is generally found that this treatment suffices for the removal of the CO_2; and heating under pressure is seldom necessary unless this compound is in unusual excess. The NH_3 is absorbed principally in the form of carbonates and NH_4HS. Upon heating, these decompose as follows:

$$(NH_4)_2CO_3 = 2NH_3 + CO_2 + H_2O$$
$$NH_4HS = NH_3 + H_2S$$

The fact that the CO_2 and H_2S in the gas partly combine with the NH_3 renders the formation of $NaHCO_3$ and $NaHS$ less than when no NH_3 is present. As the ammonium compounds are readily decomposable, the expulsion of the gases takes place readily. The decomposition of the NaHS is assisted by the CO_2 liberated in the first reaction:

$$2NaHS + CO_2 + H_2O = Na_2CO_3 + 2H_2S$$

The ammonia evolved in this process is mixed with the ammoniacal gases from the ordinary ammonia still, and the whole is passed through a common saturator for the recovery of ammonia in marketable form. The CO_2 and H_2S pass unchanged through the sulphuric acid in the saturator, and the waste gases may be used for the manufacture of sulphuric acid. Thus the invention furnishes means for making the necessary materials for the manufacture of $(NH_4)_2SO_4$, provided the gas is sufficiently rich in H_2S. Instead of utilizing the gases from the saturator in this way, they may be disposed of by putting them into that portion of the coke-oven gas used for heating the ovens.

Removal of Impurities from Gas.—No. 210,382.

KOPPERS COMPANY, of Pittsburg, Pa.

No. 3546; Feb. 6, 1923. Convention date, Jan. 24, 1923.

This invention relates to the removal of H_2S, HCN, &c., from gases containing them, by processes including treatment of the gases with a liquid absorbent circulating through gas purification and liquid revivification steps. The primary object in a plural-stage process is an economical and efficient final stage for the removal of the last traces of impurity from the gas. The last traces are removed from the gas by a liquid which has been previously revivified by treatment with a substance capable of reacting with the absorbed impurities in the liquid, leaving the latter free of contents that can exert a partial pressure with respect to the impurities in the gas.

A considerable variety of substances can be used to react with the small amount of hydrogen sulphide in the liquid (Na_2CO_3 solution) from the primary system. Examples are compounds of iron, manganese, lead, zinc, and other metals capable of forming insoluble sulphides in alkaline solutions. Specific examples are iron sulphates, iron oxides, manganese sulphates, and manganese oxides; and it is preferred particularly to use compounds of the iron group, since it is possible readily to effect revivification. The oxides, hydroxides, carbonates and other compounds of iron may be used in this way; and ordinary soft hematite iron ore is specially suitable, since it is cheap and readily available.

Advantage is taken of the fact that the actual quantity of hydrogen sulphide in the gas leaving the primary system is very small, so that a relatively small amount of reacting solution is required for its removal. This small amount of solution, as it comes from the primary system, also contains small amounts of sulphide compounds, so that only a small amount of reacting substance is used to render them inert. In ordinary practice, the solution leaving the primary actifier contains about 17 grains of sulphide compounds, calculated as H_2S, per gallon. Twenty-two pounds of ordinary iron ore are sufficient for the complete removal of the sulphide compounds from 1000 gallons of such solution; and 1000 gallons are ample for the removal of the last traces of H_2S from 60,000 to 70,000 c.ft. of gas which has passed through the primary purification stage. If ferrous sulphate be employed, 24 lbs. of ordinary crystallized ferrous sulphate are sufficient for the treatment of 1000 gallons of the solution from the primary actifier. The ferrous sulphate reacts as follows:

$$FeSO_4 + NaHS = FeS + NaHSO_4.$$

The $NaHSO_4$ reacts with sodium carbonate as follows:

$$NaHSO_4 + Na_2CO_3 = NaHCO_3 + Na_2SO_4.$$

Thus, the use of iron sulphate results in a certain loss of soda through the formation of sodium sulphate; but the actual loss is comparatively small on account of the small quantity of the substances entering into the reaction.

It is preferred to use iron oxide in the form of soft hematite ore, to warm the solution to 50° C. in contact with the iron ore, and agitate with air. The following essential reactions occur:

$$Fe_2O_3 + 3NaHS + 3NaHCO_3 = Fe_2S_3 + 3Na_2CO_3 + 3H_2O$$
$$2Fe_2S_3 + 3O_2 = 2Fe_2O_3 + 6S.$$

Rapid formation of sodium thiosulphate also occurs, so that a considerable proportion of the sulphide compounds is rendered inert in this way; but the loss of soda is insignificant on account of the small quantities involved. The heating of the solution to 50° C. is important because at lower temperatures the reactions do not occur so readily.

In carrying out the invention, the primary liquid purification system is operated as usual, removing approximately 90 p.ct. of the H_2S from the gas (see previous patents, abstracted in the "JOURNAL" for Feb. 6, p. 318). A portion of the revivified solution from the primary system is run continuously into an agitator. This is a tall cylindrical vessel equipped with perforated air pipes to which compressed air is admitted. The agitator also has steam coils for keeping the solution at a temperature of approximately 50° C. Iron oxide sludge is run into the agitator. It is desirable to admit it at such a rate that the Fe_2O_3 added will be approximately twice the reacting equivalent of the H_2S entering with the actified solution. The iron sludge is circulated through a Dorr thickener and back to the actifier. Small amounts of sulphur gradually accumulate in the system. A considerable proportion of this floats to the top of the solution, and may be skimmed off. It is only necessary to renew the oxide at long intervals to avoid excessive accumulation of sulphur. The oxide thus removed may be treated for the extraction of sulphur, and then may be returned to the system. However, the amounts of sulphur thus recoverable are so small that in most cases it is preferable to discard this material and use fresh oxide.

Fuel Gas Manufacture.—No. 214,544.

JOHNSON, J. Y., of Lincoln's Inn Fields, W.C. (A communication from the Badische Anilin und Soda Fabrik, of Ludwigshafen.)

No. 23,232; Sept. 17, 1923.

Fuel gas, for example blue water gas or mixed gas (Dowson gas), has hitherto, says the patentee, been made from coke of coarse lumps on which steam and air, alternately or jointly, are allowed to act at glowing heat. According to the usual methods of working, it has not been possible to use material such as coke dust, &c. It is claimed, however, that the latter is made possible by the present invention.

The method consists in placing the material on a suitable grate or support in a shaft furnace or producer and blowing a gas, or gases, such as air, or air and steam, through the material either alternately or jointly according to the kind of fuel gas desired, with sufficient pressure to bring about a stronger agitation or boiling motion of the material. By this means a free passage of the gases is secured, and the material is thoroughly mixed, while its combustion is not concentrated locally, but well distributed throughout the whole mass; a uniform temperature being thereby established. The ashes do not flux, but are carried along with the gases and can be deposited in an adjacent dust chamber.

Prepayment Meters.—No. 214,681.

STAPLES, C. W., of Clapham Common, S.W. 11; COX, W., Lavender Hill, S.W. 11; and GLOVER, G., & Co., LTD., of Ranelagh Works, S.W. 3.

No. 34,937; Dec. 22, 1922.
No. 11,067; April 24, 1923.

This invention relates to coin-operated prepayment gas-meters of the kind comprising a gas valve and a coin wheel arranged outside the meter body, a gas-wheel spindle arranged inside the meter body, and a spindle or sleeve extending through the coin wheel and movable axially in opposite directions by rotary movements of the coin wheel and gas wheel respectively. It has been proposed to connect the coin

wheel spindle of the gas wheel by a pin and slot joint, to allow axial movement of the coin spindle extending through the coin wheel while maintaining a rotary driving connection between the two; the axial movement being employed to move a frame carrying a pin sliding beneath an arm on the valve spindle to open and close the valve.

The present invention, according to the claims, provides mechanism characterized in that the coin-wheel spindle or sleeve has a shoulder thereon arranged to be moved into direct contact with a pin, which extends from an arm carried by the valve spindle, to move the pin and thereby to move the valve to its closed position; the spindle or sleeve having a groove therein in which the pin rests when the valve is thus brought to its closed position.

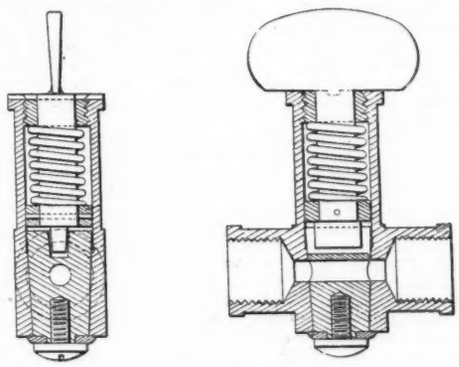
The coin wheel is carried by a detachable bracket, and the spindle which extends through the coin wheel, or a spindle carrying the sleeve which extends through the coin wheel, is connected to the gas-wheel spindle by a pin and slot connection, allowing these spindles to be separated or put into engagement solely by axial movement of the spindle, which extends through the coin wheel without requiring opening of the meter casing.

Gas Taps.—No. 214,761.

JOEL, J. A., of Leytonstone, E. 11.

No. 3685; Feb. 7, 1923.

This invention, relating to gas taps, provides a construction which will prevent the "off" position of the taps being altered except by



Joel's Gas Tap.

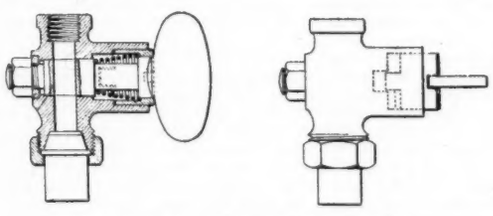
deliberate action. The form of the taps covered by the invention is clearly shown in the sectional drawings which we reproduce. It should be understood that the sides of the notches which retain the finger-piece may be sloped instead of vertical, as shown, so that increased tongue will suffice to turn the plug.

Gas Cocks.—No. 214,781.

GAS LIGHT AND COKE COMPANY, and LARKIN, F. S., both of Horseferry Road, S.W. 1.

No. 5554; Feb. 26, 1923.

This specification describes a cock for gas cookers, fires, &c., having a plug and handle formed in one piece and a separate spring-pressed



Safety Tap—Gas Light and Coke Company.

locking member normally adapted to co-operate with the fan or other handle portion of the cock or valve to lock same in its closed position, and capable of being pressed back at will to release the cock; the arrangement being such that the spring does not tend to move the plug in relation to its seating.

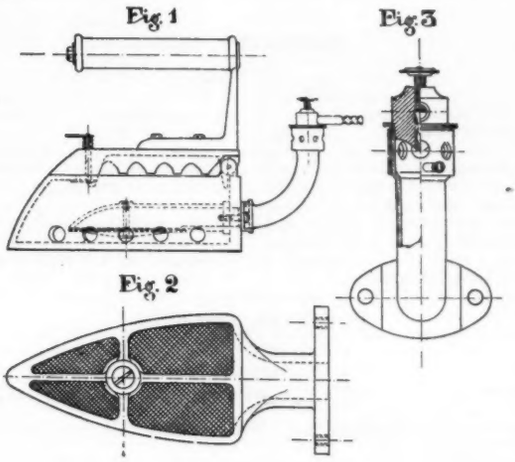
The design is clear from the drawings which we reproduce.

Gas Irons.—No. 214,850.

TOGNETTI, T., of Milan.

No. 13,617; May 23, 1923.

The subject of this invention for a gas-heated smoothing iron of the type referred to comprises the combination of a body part having lateral perforations, a handle surmounting a hinged lid, a cover grooved on its underside to provide upper openings, an inner burner member having an inverted mouth covered with wire gauze (which is secured in position by an open frame following the contour of the burner mouth and furnished with a lateral and a longitudinal rib and secured at the junction of the ribs to the back of the burner member), and an inlet pipe carrying at its outer end a mixing chamber with gas and air regulating devices. The gas admission pipe may consist of a bend formed with a resilient flange where it is connected to the body of the iron.



Gas Iron—Italy.

Fig. 1 shows the complete appliance, fig. 2 a plan of the burner, and fig. 3 a detail of the inlet pipe.

Water-Gas Plant Control.—No. 215,069.

MELLERSH-JACKSON, W. J., of Southampton Buildings, W.C.
(A communication from the WESTERN GAS CONSTRUCTION COMPANY, of Indiana.)

No. 2782; Jan. 30, 1923.

This invention relates to gas-making apparatus of the kind in which the production of gas is controlled by a series of valves operable in a predetermined order. The invention has for its primary object to provide an efficient automatic valve operating mechanism which will ensure safety and at the same time effect the operation of the several valves in the proper sequence positively and with precision.

The invention consists broadly in controlling the cycle automatically by means of a unitary power-operated device directly controlling the distribution of a hydraulic pressure medium which actuates valve mechanisms for operating the several valves. A further object is to provide for valve regulation in such a manner that the time intervals may be varied as desired, thereby permitting the duration of the several operating stages of the cycle to be changed individually at will, with the result that the apparatus may be quickly adjusted to conform to different operating conditions or to vary the product. With this object in view the apparatus has its pressure-medium distributor equipped with control devices.

The specification is of considerable length and in great detail, and refers to three sheets of close drawings. The above brief introduction must suffice for this "Register."

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for June 4.]

Nos. 12,827 to 13,436.

COX, W.—"Coin-freed gas-meters." No. 13,062.
DAVIDSON, W. B—"Fuel distillation." No. 13,143.
GLOVER & Co., LTD., G.—See Cox, W. No. 13,062.
GREGSON, W.—"Installations for carbonizing coal, &c." No. 13,135.
HOBBS, A. C.—"Gas-fires and cooking-appliances." No. 13,364.
HUDSON, G. C.—"Geysers." No. 13,369.
HUDSON, J. J.—See Hudson, G. C. No. 13,369.
KEITH, G.—"Air and gas mixing-apparatus for gas-burners." No. 12,962.
KEITH & BLACKMAN COMPANY, LTD., J.—See Keith, G. No. 12,962.
MITCHIE, A. C.—See Davidson, W. B. No. 13,143.
MITCHELL, F. G.—"Means for discharging coal, &c., from hoppers, &c." No. 13,254.
PARKER, L. P.—See Mitchell, F. G. No. 13,254.
ROUSE, F. J.—See Hobbs, A. C. No. 13,364.
SPENCER-BONECOURT, LTD.—See Gregson, W. No. 13,135.
STAPLES, C. W.—See Cox, W. No. 13,062.
TOOGOOD, H. J.—"Carbonizing plant." No. 13,170.

Price Reduction at Chorley.—At a recent meeting of the Gas Committee of the Chorley Corporation it was decided that £6035, the surplus on the last half-year's working of the gas undertaking, be allocated to the relief of the rates. After the current quarterly readings of the meters, the price of gas supplied through ordinary meters both inside and outside the borough will be reduced 6d. per 1000 c.ft., and a corresponding reduction will be made for gas supplied through prepayment meters.

Reduction in Price at Chelmsford.—At a recent meeting of the Chelmsford Corporation Gas Committee it was recommended that a reduction of 6d. per 1000 c.ft. be made in the price of gas as from April 1, and that a discount of 2½ p.ct. be allowed on accounts paid within six weeks from the last day of the month. It was also resolved that the sum of £4000 of the net profit of £5775 be placed to the reserve fund, and invested in 1929-47 5 p.ct. War Loan, and the remainder of the net profit—viz., £1775—be used as a working balance.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Progress of Bills.

Manchester Corporation Bill: Read the third time, passed, and sent to the Commons.

Copies were presented of drafts of Special Orders proposed to be made by the Board of Trade under section 10 of the Gas Regulation Act, on the application of the Burton-upon-Trent Corporation, and the Walsall Corporation.

The draft Special Orders under section 10 of the Gas Regulation Act, relating to the Freshwater Gas Company and the Poulton-le-Fylde Urban District Council, were agreed to on the motion of the Lord Muir Mackenzie.

HOUSE OF COMMONS.

Progress of Bills.

Rotherham Corporation Bill: As amended, considered; read the third time, and passed.

Manchester Corporation Bill: Read the first time, and referred to the Examiners.

The draft Special Orders proposed to be made by the Board of Trade under section 10 of the Gas Regulation Act on the application of the Harpenden District Gas Company and the Skipton Urban District Council, were approved, on the motion of Mr. Albert Alexander.

RHYMNEY AND ABER GAS BILL.

HOUSE OF LORDS COMMITTEE.

(*Before Lord* MUIR MACKENZIE (*Chairman*), *Lord* WYFOLD, *Lord* O'HAGAN, *Lord* LOCH, and *Lord* TREOWEN.)

Third Day's Proceedings.—Tuesday, May 27.

[For first and second day's proceedings, on May 23 and 26, see *ante*, pp. 609-10, 689-90.]

Mr. *Arthur Collins* (late City Treasurer, Birmingham, and at present in practice as Financial Adviser to municipal authorities) gave evidence on behalf of the petitioners. The proper name for the proposed system, he suggested, was not "basic price and basic dividend," but "minimum dividend" system. About the time when the South Metropolitan Company secured their Act, prices of labour and materials were at about the peak, and fluctuating considerably. There was no doubt that sliding-scale companies were placed in a difficult position under war conditions, and their dividends were considerably reduced; but many of them had secured relief under the Temporary Increase of Charges Act. The South Metropolitan Company obtained their Act before the Gas Regulation Act was passed. He made it clear that the petitioners did not desire that the Rhymney and Aber Company should be left without a reasonable return on capital. The point was that under the basic price system the Company made themselves the judge as to the extent of any increases in the price of gas, whereas increases in the statutory prices of maximum price and sliding-scale companies were adjudicated upon by the Board of Trade.

Witness then pointed out that, of all the public utility undertakings in the kingdom—gas, water, electricity, tramways, railways, canals, and the rest—there were only half-a-dozen companies (and those were gas companies) which had the special provisions asked for in the Bill. In addition to the gas companies which had taken advantage of the provisions of the Gas Regulation Act to obtain increases in their prices, there were others whose prices before the war were sufficiently high for them not to need to raise them even under post-war conditions. For those that did require alteration, the Board of Trade had an expert staff (of whom Mr. Honey was the head), put there by Parliament to hand out even justice as between the shareholder and consumer; and he assured the Committee that in his experience they did give satisfaction. The majority of the consumers of the Rhymney and Aber Company were working-class people. They were apprehensive of any system which placed them in the hands of a body of company directors who might charge what they thought, and yet be assured of a certain dividend—in this case 7 p.ct. They were satisfied if an independent Government Department stood between them and the Directors.

Asked whether the sliding-scale or the basic price system was the most sound and efficient, witness said that it depended upon where the "pivotal point" was fixed. If a sliding-scale company had a standard dividend of 5 p.ct., they would have to economize and maintain a continuously progressive policy in order to get the dividend. If they fixed a 7 p.ct. minimum dividend, particularly where a company had never paid a 7 p.ct. dividend before, except on an isolated occasion, the company would not make an effort to economize; but if the minimum dividend were fixed at 3 p.ct., they would economize in order to increase it.

In asking the Committee to consider local circumstances more particularly than precedents in this case, witness remarked that the Rhymney and Aber Company was almost entirely a "middle-man" company. It had been said that the basic system encouraged companies to effect economies. In this case, however, there was no scope for economy, in that the Company did not manufacture their own gas and had no control over the manufacture. Another important point of differentiation between this and other companies was that this particular company required practically no capital to develop it. In the case of the South Metropolitan Company it had been found impossible to raise fresh capital on the sliding-scale system with the dividend so low; but in the case of the Rhymney Company, apart from occasional mains and extensions of mains, there was practically no capital for which they needed to go to the market. Again, a considerable part of the capital was locked-up in works which were either derelict or stand-by, because they were not manufacturing gas. If it had been an ordinary commercial undertaking, and their Lordships on the Committee had been on the Board, he could well imagine that they would have demanded a reconstruction of the capital. Whatever the merits of the minimum dividend and sliding-scale systems, it was not usual for a company in this position to stabilize the capital and the dividend with it.

After stating that a co-partnership scheme could be applied to a sliding-scale as well as to a basic price company, witness said that, after testing the accounts of companies working under the basic price system, he had found nothing whatever to indicate that their experience had been different from that of sliding-scale concerns. The real reason why basic price companies had done well for the consumers was that the cost of labour and the materials used for the manufacture of gas had fallen; and, given the most incompetent board of management that could be conceived, they could not have failed to reduce the price of gas by reason of that fall in costs. He had found nothing whatever to show that the existence of the basic principle had in any way induced economy which had not automatically come to all others, whether on the maximum price or sliding-scale basis.

Continuing, witness said that under the minimum dividend system the consumer obtained three-quarters of any profits after the 7 p.ct. dividend had been paid, but if there were losses the consumer had to bear them alone. Under the sliding-scale system, however, they all helped to share both losses and profits. He also said that, though Parliament fixed maximum prices and dividends, they did not guarantee that the maximum prices should be sufficient to pay the maximum dividends, and the Rhymney Company could not have paid 10 p.ct. in any case with the existing maximum prices. For some years before the war they had only paid 5 p.ct., but now they were asking for 7 p.ct. to be stabilized.

In the course of cross-examination of the witness, Mr. ROWAND HARKER (for the promoters) drew attention to witness's statement that if a company were distributing and not manufacturing gas, there was less scope for economy than if they were manufacturing as well as distributing, and said that, if that were so, surely it was unfair to ask that the Company should be changed over from the maximum price to the sliding-scale system! Witness did not agree, and said that in this case the Company had taken far too narrow a view. One of the most important elements in securing a supply of cheap gas and a higher dividend in this case was the price paid to the Powell Duffryn Company for the bulk supply. If and when the Gas Company, in making contracts for an increased supply from the Coal Company, made a better bargain and obtained gas more cheaply, they began to share the benefit with the consumers after they had paid the 7 p.ct. dividend; but if they had to pay more to the Coal Company, the consumers only were affected. He was apprehensive that the natural consequence of the powers asked for in the Bill would be that when the Gas Company came to setle the price of gas with the Powell Duffryn Company, the latter could say they could charge the Gas Company any price they liked because they could afford to pay a big price, being assured of their minimum dividend; then the consumer would have to make it up. But under the sliding-scale system, the price paid for the bulk supply would affect the dividend if it were too high, and that was the element that had been overlooked.

It was pointed out by Counsel that there was a revision clause relating to the "costs and charges of and incidental to the 'purchase' of gas" as well as production; but this was not sufficient for the witness. It was also pointed out to him that the price was fixed for the next ten years, but he said that did not matter to him, and clung to his view that it was a bad thing for the Powell Duffryn Company and the Gas Company to be able to say that it did not matter what the latter paid for the gas because their 7 p.ct. was all right.

As to pre-war dividends, Counsel secured agreement from witness that the Gas Company could have paid more if they had operated as a gas undertaking only, and had not been saddled with the water undertaking.

A discussion followed in regard to what Mr. Harker described as the romantic phrase about saddling the consumer with a large amount of dead capital in respect of derelict or stand-by plant. Mr. Harker pointed out how essential it was for the Gas Company to maintain their works in order to fulfil statutory obligations in the event of the supply of coke-oven gas from the Powell Duffryn Company failing as the result of a temporary difficulty—such as a coal strike or a railway strike. With this witness agreed, and said that in respect of the capital represented it would be entitled to a fair return. When they came to settle details, however, they would have to consider that if they were to add the costs of maintaining stand-by plant in order to fulfil statutory obligations in the event of the failure of the supply of coke-oven gas, there would be good ground to ask for the elimination of practically all the stand-by plant, on the ground that if the Powell Duffryn Company's supply failed, the Gas Company's supply would fail for the same reason—such as in the event of a coal strike.

Reference was then made to the Sheffield Gas Company's Act of 1922, giving them power to supply on the basic dividend principle, and Counsel said that the Act was passed after the Gas Regulation Act. He asked if it were not the fact that in the Sheffield case Mr. Collins (who had acted for the Corporation) had advised them that they were properly considering the interests of the consumers by consenting to the basic price system upon the figures which were ultimately agreed to be placed in the Sheffield Act. Witness replied that the fair way of putting it was to say that the Sheffield Corporation were influenced by the fact that the Sheffield price was so low that there was not the same point in fighting it as there would have been had the price been higher.

No other evidence was called by the petitioners on the question of principle, and Mr. H. C. Honey (Director of Gas Administration at the Board of Trade) was asked if he would state the views of the Board on the matter. He said that the sliding-scale had been in operation since 1875, and in any of the circumstances which arose

before the war it was found to work exceedingly well, but the abnormal rise of costs during the war had put it out of gear. The basic price system was invented before the procedure under the Gas Regulation Act had been laid down. The object of the Gas Regulation Act was to put the machinery once more into operation, and to that extent the object of the Regulation Act and of the South Metropolitan Company's Act was the same.

With regard to the shareholders of any company adopting the basic price system, almost the only advantage he could see was that a minimum dividend was in effect guaranteed without any restriction on the charging powers of the company. But it was a great departure from the ordinary sliding-scale provision. As to the minimum dividend, the view of the Board of Trade generally was that the existing sliding-scale provisions gave the shareholder adequate protection; but if the supply of fresh capital for the purpose of an undertaking was likely to be dried up because of the uncertainty of the conditions under which the sliding-scale was operating, the Board of Trade would not feel any strong objection to a minimum dividend in itself, solely for the purpose of inducing a flow of fresh capital to the industry. Under present conditions, he did not think the Board of Trade were of opinion that such an inducement was necessary to enable fresh capital to be drawn into the industry. Fresh capital was being raised (so far as his researches went) on terms which were as favourable in the case of ordinary sliding-scale companies as in the case of companies which were working under the basic price and basic dividend system. The Board had no evidence whatever that the adoption of this system had led to better prices being obtained for new capital.

As to the consumer, the particular consumer protected under the sliding-scale was the ordinary consumer. The difference between the system proposed in this Bill and the sliding-scale was that the average price in the former case was proposed to be taken, not only for the ordinary consumers, but also for consumers of gas for power and other purposes. They were all lumped together and the average price taken, with the result that in a number of cases it was conceivable that a company might become entitled to pay a higher rate of dividend although the price of gas to the ordinary consumer had not been touched. Indeed, it would be theoretically possible to increase the price of gas to the ordinary consumer, and, at the same time, by the operation of the basic price principle, for the company to be able to pay a higher dividend. The view of the Board of Trade was that the basic price principle altered to a considerable extent the incidence of the protection that the consumer obtained.

As to the machinery by which the amount of additional dividend was to be arrived at, he pointed out that the amount could only be reached by a calculation which was an intricate one, and based upon factors not disclosed in the published accounts of the company, and which it was scarcely necessary to disclose in the ordinary way. Further, there was no provision under which any particular person was responsible for certifying the amount of the surplus profits on which the calculation as to increased dividend was based. He was not at all sure that the matter was one which would, in the ordinary way, come within the purview of the auditor, and there were some points in the calculation which appeared to him to depend upon the particular accounting methods adopted by the company's auditor. The practice of companies' accountants varied. Only the person who made the calculation could say whether it was right or wrong; and when he arrived at his hypothetical figure, it was one that did not itself determine the additional dividends to be paid, but which afforded an index to the additional dividend. It was true that it set up a maximum beyond which the additional dividend could not go, but it did not indicate the additional dividend to which the company were entitled.

With regard to the profit sharing scheme, there was no reason why that should be considered as an inherent part of the system itself. Many sliding-scale undertakings had profit-sharing schemes which were as effective as any under the basic-price system, and profit-sharing could be introduced equally well with either system.

The CHAIRMAN said he did not understand that the Board made any strong objection to introducing the basic principle; they thought that everything that could be obtained by it could be secured under the sliding-scale system.

Mr. HONEY said the Board were prepared to rely on the ordinary sliding-scale provisions rather than to introduce provisions of the nature proposed in the Bill; but section 1 of the Gas Regulation Act did not enable the Board of Trade to impose a sliding-scale. Under section 1 they could not alter an existing standard price to a maximum price, or a maximum price to a standard price. Under section 10, Special Orders could be made, and by that procedure, on the application of a company for an Order, a standard price could be imposed, and he believed he was right in saying that a basic price could also be authorized. Up to the present the Board had not felt that the policy of Parliament with regard to the basic price had been sufficiently defined to justify them in adopting the new principle. Apart from this, they had not been satisfied that the new principle was necessary, or that it was a desirable one.

Lord TREOWEN asked Mr. Honey if he would say that the basic system was a diversion from the line of evolution which had brought about the sliding-scale.

Mr. HONEY said he would not, but it altered the incidence of protection that the consumer had by diverting it from the ordinary consumer to the general body of consumers.

Lord TREOWEN said it would be fair to consider that it was in the same line of evolution, and that it was, as far as he had been able to judge, a more easily understood state of evolution than was reached in the sliding-scale.

Mr. HONEY said his personal view was that it was not evolution, but decadence.

Mr. TYLDESLEY JONES pointed out that that was Mr. Honey's personal view; the previous view was that of the Board of Trade.

Lord TREOWEN asked if it were the opinion of the Board that the system was reactionary.

Mr. HONEY would not go so far as to say it was reactionary. He did not think it was as good a system for the consumer as the ordinary sliding-scale system. Anyone could understand exactly what dividend the Company was entitled to pay under the sliding-scale system, but under the basic system nobody knew until the accounts were made up.

Lord TREOWEN: You think it is a hopeless movement from the old system?

Mr. HONEY: Yes.

Questions were put by Mr. HARKER, through the CHAIRMAN, to Mr. Honey. He asked whether it was the opinion of the Board of Trade that, from the point of view of the consumer, it was better for the company to be a basic-price company as distinguished from a maximum-dividend company.

Mr. HONEY said it was conceivable, but it depended upon the amount of the basic price and dividend.

Mr. HARKER asked if Mr. Honey would agree to the proposition that, as between the two principles—provided a fair and proper basic price and basic dividend were fixed, in the view of the Board of Trade—a company working under such a system would be, from the consumers' point of view, preferable to a company working under the maximum price and dividend system.

Mr. HONEY said he should say it was something intermediate between the maximum price and dividend system and the sliding-scale.

Sir LYNDEN MACASSEY, K.C., then addressed the Committee, and summed up the evidence given. If this system were approved, the Company would have the right to increase the price of gas as much as they pleased in order to maintain their dividends, and he impressed strongly upon the Committee that it did not, and could not, conduce to the efficiency of gas administration that there should be no restriction placed upon the ability of a company to increase prices. A badly-managed company would have the right to place upon the consumer the whole burden of its bad management and inexperience, and to increase prices to whatever was necessary to maintain its minimum dividend. This was not a principle that Parliament was likely to approve. Under the sliding-scale system there was great inducement to effect economies. In 1920, when the South Metropolitan Company's Act was passed, circumstances were entirely different from what they are now; costs and prices were fluctuating to an extreme degree and the future uncertain, and it was necessary to secure the dividends in order to enable the South Metropolitan Company to raise capital. But conditions are more stable now, and he laid stress on Mr. Honey's remark that fresh capital is being raised by sliding-scale companies on terms quite as favourable as by basic-price companies. The dominant circumstance which was accepted by Parliament in 1920 as justification for departing from the accepted, tried, and proved sliding-scale, and adopting the basic-price principle, had disappeared. The Committee had observed the fervent enthusiasm with which Dr. Carpenter (who was the proud inventor of the system) had given his evidence. Dr. Carpenter had been as zealous a missionary in support of his child as any person could be. Since the South Metropolitan Company's Act in 1920, only six companies had asked for, and had obtained under varying circumstances, basic-price powers. The majority of companies had evidently found the sliding-scale satisfactory.

The Hon. EVAN CHARTERIS, K.C., said the Committee had never had an explanation as to why it was thought necessary to introduce the Bill at all, and if they examined the position it reduced itself to this: That whereas the Company had paid a 5 p.ct. dividend before the war, and last year, owing to a fortuitous combination of circumstances, had earned enough to pay 7 p.ct., they had taken the opportunity of asking Parliament to stabilize that 7 p.ct. for all time, and to give them a basic price which would enable them to produce that dividend. It was an enormous swing-over from the policy which had been associated hitherto with all public utility companies. He asked the Committee to cut out those parts of the Bill which proposed to apply the therm system of charging and the basic principle, thus leaving the Company as they are, and enabling them to go to the Board of Trade for the purpose of fixing a sliding-scale. The consumers were entitled to special consideration, though he did not ask for it, but simply asked the Committee to uphold Mr. Honey's view, that the basic-price system was not so uniformly satisfactory as the sliding-scale.

Mr. HARKER, replying to the last point made by Mr. Charteris as to special consideration for the consumers, asked the Committee to look at the matter impassionately, and to endeavour to do what they thought was right for the consumer. As to the suggestion that there had been no real explanation as to why the Bill was presented, the promoters had hoped that they had satisfied the Committee that the circumstances of this particular Company were so peculiar—owing to the separation of the water and gas undertakings so recently as 1921, and to the unusual circumstance that they were buying the whole of the gas they sold—that they justified their asking for the whole of the position to be reviewed and for a decision on the principles put forward. He trusted the Committee were satisfied that this was not a case in which it would have been at all practicable to have gone to the Board of Trade for an Order under section 1 of the Gas Regulation Act. Regarding the suggestion that the Company should be turned compulsorily into a sliding-scale undertaking, it was an unfair advantage for the opponents to take of a Company which had served them well. He saw no reason why the Company should not be entitled to a minimum dividend. They had served the public well, they were subject to innumerable restrictions, the public were protected in a hundred-and-one different ways, and in this Bill they were protected by a provision for the revision of the basic price. He asked the Committee not to endorse Mr. Honey's view that the approval of the basic system was a retrograde step for Parliament to take, and to bear in mind what had been said by the one witness who had had real practical experience of the working of the system—namely, Dr. Carpenter—and who was in no way connected with the Rhymney Company. It had been suggested that Dr. Carpenter, being the father of the child, had naturally come forward to support it; but Dr. Carpenter was much too big a man in the gas industry to come forward and attempt to support a thing which he did not honestly believe would work well. Dr. Carpenter was a better judge of this matter than Mr. Honey, who could not understand why others could not comprehend the system with which he himself was so familiar.

After the Committee had deliberated in private,

The CHAIRMAN announced that the Committee were not prepared to rule out on principle the basic or minimum dividend system as though

it were essentially inapplicable to any public undertaking; but in all the circumstances of this Company, and in view of the strong opposition of all the local authorities, the Committee were of opinion that the basic price and dividend should not be applied in this case.

Mr. Harker then applied for an adjournment. The Company, he said, wished to convert their present maximum price per 1000 c.ft. to a maximum price per therm. They desired to avoid an inquiry before the Board of Trade to settle the point, and wished to give the parties an opportunity to agree as to what should be the appropriate maximum price for the future. If agreement were reached, the Committee would be asked to insert a clause in the Bill converting the maximum price. But if they were unable to come to terms, he did not think they should ask the Committee to go into the intricate calculations which would have to be made, and they must of necessity go to the Board of Trade.

Mr. F. N. Keen said the Gelligaer and Caerphilly Urban District Councils would be pleased to meet the promoters in an attempt to agree, but wished first to discuss among themselves whether they would accede at once to the idea of a maximum price per therm being inserted or should press for the application of the sliding-scale.

The Chairman said the Committee had nothing to say about that at present.

The Committee accordingly adjourned until Monday, June 2.

Monday, June 2.

The Committee of the House of Lords (presided over by Lord Muir Mackenzie) who have been considering this Bill (see "Journal" for May 28, p. 609) met this afternoon to hear the result of the conversations which have been taking place between the parties since the Committee's decision was announced.

Mr. W. E. Tyldesley Jones, K.C., for the promoters, said that agreement had been reached, under which the Gas Company would adopt the sliding-scale principle. The standard prices were to be 11·3d. per therm, with a neutral zone up to 11·7d. per therm in the Rhymney Urban District and the village of Pantlottyn, and 12·7d., with a neutral zone up to 13·1d., in the remainder of the district. The standard dividend was 7 p.ct., and the slide 3s. 6d. p.ct. for every 0·2d. per therm. These figures related to the supply of coke-oven gas only. Should it be found impossible to get a supply of coke-oven gas from the Powell-Duffryn Coal Company in the future, and the Company had to make gas themselves, the standard price was to be fixed by the Board of Trade. Counsel expressed the view that the settlement was a very fair one, and reflected great credit on the technical advisers of both parties.

The Hon. Evan Charteris, K.C., speaking on behalf of the Bedwellty Urban District Council, said that that authority desired to reserve its rights for a subsequent occasion. Part of Bedwellty was supplied by the Company under an agreement which would expire in 1929; and the Council did not consider that the arrangement arrived at by the Company and the other petitioners was satisfactory in their own case, owing to the particular circumstances obtaining.

LEGAL INTELLIGENCE.

LITIGATION OVER THE BELFAST GASHOLDER.

Contractor Claims £24,000.

Litigation has arisen over the erection of the giant spiral-guided holder at the Belfast Gas-Works, which was inspected with so much interest by the members of the Institution of Gas Engineers during their visit to Belfast for the annual conference last summer.

In the King's Bench Division of the Northern High Court on Friday, before the Rt. Hon. Mr. Justice Brown, in the action of John Graham, contractor, Dromore, against the Belfast Corporation, it was sought to recover £24,000, alleged to be due in respect of a contract to erect the holder. Mr. A. B. Babington, K.C., moved, for the Corporation, to have the matter referred to arbitration, as laid down in the terms of the contract. He said there was really no reason why the question should not be referred to an arbitrator. It was one eminently for arbitration. It lay entirely within the arbitration clause, and, consequently, the Corporation were entitled to have the motion. Mr. E. S. Murphy, K.C., for the plaintiff, submitted that the application to send the case before the President of the Institution of Gas Engineers should be refused. His Lordship would see that one of the most important matters that arose for decision in the case related to the actual warranty of the plans made by the Corporation in connection with the site of the work. Certain borings had been made by the Corporation officials, and no rock had been found; but when the plaintiffs began to drive piles, they encountered rock. This did not come within the arbitration clause, and he submitted that if the case rested on that alone they would be entitled to say it was not a case for arbitration. Difficult questions of law and of fact, he submitted, arose which should be weighed by a judicial tribunal.

His Lordship said both parties, with their eyes open, entered into a contract in which one of the clauses was that every dispute which arose touching the terms of the contract, or the rights or liabilities of the parties, should be referred to arbitration. Both entered into that contract with the one object in view. In the contract, amounting to £52,000, for the erection of a large holder, there were likely to be differences, and the object of the clause was that these disputes and differences should be referred to arbitration. He was of opinion that this was an ideal case for arbitration, and granted the motion with costs.

The Palermo Gas Light and Power Company, Ltd., has been registered, with a capital of £50,000.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

There has appeared in the "London Gazette" the following further notice regarding applications to the Board of Trade under the Gas Regulation Act.

DECLARATION OF CALORIFIC VALUE.

Colne Corporation.—420 B.Th.U. (July 1.)

GAS REGULATION ACT ORDERS.

The following appeared in the "London Gazette" dated June 3.

AMENDING ORDER.

Commercial Gas Company.

The Board of Trade give notice that the London County Council have made application under sub-section (3) of section 1 of the Act for an Amending Order revising the powers of charging authorized by the Commercial Gas Company (Charges) Order, 1921. The standard price which the Board of Trade propose to authorize in lieu of the existing standard price of 15·4d. per therm is 11·4d. per therm.

Any person affected desiring to make representations with regard to the application may do so by letter addressed to the Director of Gas Administration, Board of Trade, Great George Street, S.W. 1, not later than June 14, 1924.

A copy of such representations must at the same time be sent to the Clerk to the London County Council and to the Secretary of the Commercial Gas Company.

SPECIAL ORDER.

Monmouth Gas and Waterworks Company, Ltd.

A Special Order is to be sought by the Company to empower them to raise further capital, to acquire additional lands, to adopt the therm basis of charge, to regulate the supply of gas, &c.

BARROW GAS STATISTICS.

At the Barrow-in-Furness Town Council meeting, on Monday of last week, Alderman J. Whinnerah, in moving the adoption of the Gas and Water Committee's minutes, embodying a reduction in the price of gas by 3d. per 1000 c.ft. from July 1, gave his first annual report upon the working of the undertakings.

For a few years, he said, the Chairman of the Committee had had to report decreases in gas consumption, but in the past twelve months there was an increase. The total quantity of gas sold was 283,975,000 c.ft., as compared with 279,511,000 c.ft. for the previous year—an increase of 1·6 p.ct. He trusted this was evidence of the fact that they were round the corner at last. During the year an 18-in. gas-main was laid on the bed of Walney Channel, with a view to extending the supply of gas to Walney Island. It would be remembered that a canvass was taken, when approximately 85 p.ct. of the residents signified their willingness to take advantage of the supply in the event of gas being available on the island. The result of the scheme would be a substantial increase in the quantity of gas sold, which should have a big effect in reducing the cost of manufacture.

During the year it was found necessary to renew the retort settings at the Salthouse Works, at a cost of £2000; and this necessitated the plant being closed down for three months. This was the first renewal of these settings since their installation in 1917. In addition to the resetting of the verticals at the Salthouse Works, a large cast-iron storage tank for ammoniacal liquor was installed at the Hindpool Road Works. The purifiers attached to the carburetted water-gas plant were practically renewed, and these had now been made to work in conjunction with the purifiers attached to the coal-carbonizing plant. Many people asked why the price of gas was 4s. 3d. per 1000 c.ft. to-day, as against 2s. 6d. in 1914. He had got out an interesting comparison with 1914, and would draw attention to four outstanding points as an explanation. Loan charges were up by £6600, equal to 79·1 p.ct.; renewals, £4834, equal to 120·6 p.ct.; salaries and wages, £9859, equal to 95 p.ct.; and coal, £11,759, equal to 50·1 p.ct.—a total of £33,052, which was approximately 2s. 4d. per 1000 c.ft. Another fact was that in 1914 one works was producing 318 million c.ft. per annum; whereas now two works were producing 283 millions. It was just possible that the Committee might find it more economical to transfer the whole of the gas producing plant to the Hindpool Road Works. The Committee and the Manager were fully alive to the necessity of exercising economy wherever possible; and this was borne out by the fact that they were making a second reduction in the price of gas in six months.

Alderman Thompson and the Mayor (Alderman Fairbairn) congratulated Alderman Whinnerah upon the report, which was approved.

Nottingham Plumbers' Strike.—The strike of Nottingham plumbers in sympathy with former employees of the Corporation Gas Committee has now entered upon its eighth week, and has recently given rise upon the part of the men's leaders to an acrid attack upon Mr. Arthur Hayday, M.P. for the Western Division of the City, who is one of the principal officials of the National Union of General Workers, and is Joint Secretary on the labour side of the Gas Industrial Council. The squabble between rival trade unions continues with no hope of immediate settlement; and meanwhile there is little prospect that the extravagant claims put forward on behalf of semi-skilled men will be conceded by either the Nottingham Gas Committee or others having the control of similar undertakings.

BIRMINGHAM GAS DEPARTMENT REPORT.

Alderman Lloyd's Statement to the City Council.

The annual statement on the activities of the Birmingham Gas Department was made by Alderman J. H. Lloyd (the Chairman of the Committee) at a meeting of the City Council on Tuesday, June 3.

In moving the adoption of the report [*ante*, p. 692], Alderman Lloyd said it was gratifying to be able to present so satisfactory a statement. Not only had the price of gas been reduced on three occasions during the twelve months, from a top price of 3s. 10d. to the present highest scale price of 2s. 10d., representing a reduction of 1s. per 1000 c.ft.—a concession to consumers amounting to £343,000—but the general results, as indicated by the accounts, were satisfactory. The very substantial increase in the consumption of gas would be noticed. This increase amounted to well over 1000 million c.ft., or practically 10 p.ct., and it was particularly satisfactory to record that the use of gas for manufacturing and motive power purposes in the twelve months showed an increase of 25 p.ct. as compared with the previous year's figures. Some members might be surprised to hear that the increase of 1079 million c.ft. in output last year, when this thermal energy was calculated as electrical units, was greater than the total output of current of the Electricity Department in 1922-23. It was interesting, also, to observe that the quantity of gas distributed in the twelve months under review, in excess of the previous year—that was again, the increase alone—was equal to the combined consumption over twelve months of West Bromwich, Walsall, and Tipton. This would give some idea of the size of the Birmingham gas undertaking. The prosperity of cities such as Birmingham depended more than ever before upon an adequate supply of cheap light, heat, and power. Members of the Committees responsible for the gas and electric supply were constantly brought face to face with this fact, and it was this point of view which made them specially desirous to reduce the cost of gas whenever possible. The Gas Committee, at the urgent request of the Finance Committee, this year allocated to the rates £42,000, which was equivalent to nearly 1d. per 1000 c.ft. on the price of gas. According to long-standing practice, the borough fund had been relieved by concessions in the price of gas for public and court lighting and maintenance charges, and in repairs to the old Art Gallery roof, to the extent of a further £29,780. With regard to the current year, the Committee considered it necessary to sound a warning note, for it must be remembered that they had to carry through the whole of the present year the reduction of 3d. per 1000 c.ft. from the December reading of the meters, which only affected a small portion of last year's results; and this had to be done in face of considerable weakness in the residual markets—particularly tar and ammoniacal liquor. The Council must not, therefore, in existing circumstances, look for any reduction in the present price of gas. He invited members of the Council to inspect the progress in the construction of the new gasholder tanks at Washwood Heath. A few statistics with regard to the construction of these tanks might interest the Council. There was more than sufficient room in each of the tanks to house the Birmingham Town Hall. The amount of earth which had to be removed in the excavation and return of the soil to form the banks around the tanks after completion was upwards of 170,000 tons; the cement used in the concreting over 4500 tons; and the sand and gravel forming the concrete aggregate over 30,000 tons. The weight of puddle, which varied from 12 in. to 2 ft. in thickness, at the bottom and round the tanks was 20,000 tons. The amount of concrete used in the construction of the tanks, if built into a wall 6 ft. high by 9 in. thick, would reach a length of practically 25 miles, or would construct a roadway 30 ft. wide by 9 in. thick and 5 miles in length. The water capacity of the two tanks was 20 million gallons, or about four-fifths of Birmingham's daily water consumption. It was hoped that the first holder would be completed in November of this year.

The report was adopted.

GAS REPORT AT LEEK.

The report of Mr. R. H. Ginman (the Gas Engineer and Manager), for the year ended March 31 last, has been adopted by the Gas Committee of the Leek Urban District Council, who have passed a vote of thanks to him and to the staff for the excellent results recorded, which have rendered possible a further reduction in the price of gas—making the current charges from 2s. 2d. to 3s. 3d. net.

Mr. Ginman's report shows that there was for the year a satisfactory increase in the consumption of gas, though the receipts from this source were somewhat less in consequence of a reduction in price which took effect from the commencement of the financial year. The net cost of gas decreased by 3·88d. per 1000 c.ft. of gas made. The gross profit of £7558 compares with £8081 for the previous year; but the net profit of £3081 (against £2508) constitutes a record for the undertaking. The gas made (147,571,000 c.ft.) shows an increase of 6,628,000 c.ft. The yield of gas per ton of coal carbonized was 14,299 c.ft.; the corresponding figure being 14,382 c.ft.

Bognor Gas Company.—By instruction of the Directors of the Bognor Gas Light and Coke Company, Messrs. A. & W. Richards are offering for sale by tender £13,000 6 p.ct. redeemable debenture stock; the minimum price of issue being par. The dividends paid for the year ended Dec. 31 last were at the rates of 6¼ p.ct. on the "A" and new consolidated stocks, and 6⅜ p.ct. on the "B" stock; and after payment of these dividends a balance of £10,423 remained to be carried forward as undivided profit. The capital now being issued is required for extensions of the Company's plant, machinery, mains, &c., rendered necessary by the increasing demands for gas and electricity. Tenders are to be sent in to Messrs. Richards, at No. 37, Walbrook, E.C., not later than 11 o'clock on Friday, June 13.

FLUELESS GAS-STOVES.

Appendixes to a Recent Report by a Joint Committee of the Society of Medical Officers of Health and the Royal Sanitary Institute.

In last week's "JOURNAL" (p. 695) there was reproduced the report of a Joint Committee of the Society of Medical Officers of Health and the Royal Sanitary Institute, appointed to consider the use of gas-stoves for domestic and workshop heating where no provision is made for the escape of flue gases. The Committee consisted of: Representing the Society of Medical Officers of Health—Prof. H. R. Kenwood, C.M.G., Dr. D. C. Kirkbope, Dr. F. N. Kay Menzies, and Dr. E. H. Snell. Representing the Royal Sanitary Institute—Prof. A. Bostock Hill, Dr. J. S. Owens, Dr. L. C. Parkes (Chairman), Mr. J. Osborne Smith, F.R.I.B.A., and Mr. H. D. Searles Wood, F.R.I.B.A. Attached to the report were a number of appendixes, from which the subjoined particulars have been extracted.

CORRESPONDENCE WITH THE CHIEF INSPECTOR OF FACTORIES.

Mr. G. S. Elliston (Executive Secretary to the Joint Committee) wrote to the Chief Inspector of Factories a letter of which the main portion was: "In a recent communication from the Gas Light and Coke Company, Westminster, it is stated that it is the practice of the Company to take samples of the air in workshops where flueless gas-stoves are in use, and to determine the carbon dioxide therein; and only so long as this does not exceed 12 parts in 10,000 do the Company ask the Factory Inspector to waive his objections. This he readily does when the evidence is placed before him. The Joint Committee understand that the standard of 12 volumes of CO_2 per 10,000 volumes of air was fixed by a Departmental Committee in 1903, and is applicable to workshops during daylight, or after dark when electric light only is used. When gas or oil is used for lighting after dark, the standard is 20 volumes of CO_2 per 10,000 volumes of air. The Joint Committee will be glad to know if the practice of H.M. Inspectors of Factories is stated by the Gas Light and Coke Company—namely, that no objection is raised to the use of flueless gas-stoves for securing and maintaining a reasonable temperature in workshops, provided the Departmental Committee's standards are not exceeded, when the air is examined. It is evident to the Joint Committee that in the case of workshops heated by flueless gas-stoves the standard of purity of the air might be attained where the arrangements for ventilation of the workshop are satisfactory and are in operation. Is the Home Office satisfied that flueless gas-stoves do not interfere with the purity of the air of the workshop, when windows or other means of ventilation are closed?"

The Chief Inspector's reply was: "The question whether the use of a flueless gas stove is a contravention of the Act from the mere fact that the stove gives off its fumes into the workroom, is one which has never been legally settled. The section is, however, one of the health sections of the Act, and we have interpreted it from this point of view. We take into consideration, for instance, whether the purity of the air is interfered with to a degree that is likely to be injurious to the health of any of the persons employed, or whether the room is provided with means of ventilation adequate to secure the removal of any fumes given off and to preserve the atmosphere from appreciable contamination. One of the tests we employ is to analyze air samples for a CO_2 determination; but we should not necessarily waive objection to a flueless stove because the analysis showed a proportion of CO_2 less than 12 parts in 10,000. We should always consider other relevant matters, such as the possibility that the means of ventilation cannot always be maintained to the full extent."

A report from the City of Glasgow Public Health Department states that visits were made to a large number of premises in the north-eastern district, in order to ascertain what types of gas-stoves were in use; and it was found that in almost every case where gas-appliances were installed adequate flues were provided. One dancing hall was seen in which gas-radiators were used for heating. These were only utilized for an hour or two in the evening, and there were no complaints of fumes.

The Public Health Department of the City of Liverpool report: "With regard to the use of gas-stoves for warming workrooms and factories, it has always been the practice of the Department to insist upon flues being provided to gas-stoves; and in the event of a gas-stove being fixed without a flue, a notice is served upon the occupier. In a few instances, gas-radiators for warming have been installed in workshops and factories; but, in connection with these, no special provision is made by the makers for carrying off the fumes, as they claim that the combustion is perfect, and a flue is not necessary."

SUMMARY.

Number of workshops	2739
Number of flueless gas-radiators in workshops	8
Number of factories	1930
Number of flueless gas-radiators in factories	6
Number of work places (mainly kitchens of restaurants)	320
Number of gas-cookers in kitchen restaurants not at present connected to flues	26

NOTE.—These cookers are at present receiving the attention of the department.

The figures in respect of laundries are included in the workshop and factory figures.

It is added that gas-cookers, gas-rings, and hot-water geysers, not provided with flues, are occasionally found in connection with dwellings; but there is no evidence of any ill-effects arising from the use of these fittings, and no complaints or references have ever been received by the Department in regard to them.

The Medical Officer of Health for Nottingham says flueless gas-stoves "are now used hardly at all in this district, as: (1) We have set our faces against them in recent years; (2) we have had existing stoves removed when this was reasonably possible; and (3) we have forbidden their introduction afresh."

Enclosing a number of reports on various premises in which flueless gas-stoves are in use, the Medical Officer of Health to the City of Leeds says: "I am afraid they do not carry us much further—indeed,

they rather give the impression that such appliances do not have the bad effect upon health generally attributed to them."

The final appendix is reproduced practically in its entirety.

REPORT ON FLUELESS GAS-FIRES FROM THE HYGIENIC ASPECT.

By Dr. J. S. OWENS.

GAS-BURNING APPLIANCES USED WITHOUT FLUES.

Omitting ordinary gas-burners used for lighting purposes, the following are the chief forms in which gas is consumed for domestic purposes without the provision of a flue:

(1) Flueless gas heating stoves, using bunsen or luminous flame.
(2) The so-called gas-radiators, using bunsen or luminous flame.
(3) Gas-cookers of the usual type, with burners for boiling and cooking, and oven.
(4) Gas-rings for occasional cooking, heating irons, &c.
(5) Water heaters, geysers.

COMPOSITION OF GASES.

An average coal gas has the following composition (ref. 1*):

	P.Ct.	
CO_2	3·7	
O_2	1·4	
HC	3·2	Calorific value: 525 B.Th.U. per c.ft. gross.
CO	11·7	
H_2	40·5	
CH_4	26·0	472 B.Th.U. per c.ft. net.
N_2	13·6	
	100·1	Sp. gr., 0·519.

An average blue water gas has the following composition (ref. 1):

	P.Ct.	
CO_2	8·2	
O_2	0·9	
HC	0·7	Calorific value: 314 B.Th.U. per c.ft. gross.
CO	30·5	
H_2	46·3	
CH_4	3·5	287 B.Th.U. per c.ft. net.
N_2	9·9	
	100·0	

A mixture of coal gas with blue water gas may contain 20 to 30 p.ct. of the latter. A fair sample of such a mixture would have the following composition (ref. 1):

	P.Ct.	
CO_2	6·6	
O_2	1·3	
HC	1·2	Calorific value: 365 B.Th.U. per c.ft. gross.
O	24·3	
H_2	43·2	
CH_4	11·0	330 B.Th.U. per c.ft. net.
N_2	12·3	
	99·9	

Analyses made by the London County Council of gas supplied by the Gas Light and Coke Company (ref. 17) showed that the percentage of CO in gas in 1912 was 14·3, and in 1922 it was 15·8; thus showing a very slight rise. In 1921 it was 19·7, owing to the special conditions arising from the coal strike.

An analysis of the gas supplied to London by the Gas Light and Coke Company made on Jan. 9, 1922, by Mr. Clark, the Company's Chemist, and kindly supplied to me by him, showed the following composition:

	P.Ct.	
CO_2	2·71	
O_2	1·40	
HC	2·71	Calorific value: 498·2 B.Th.U. per c.ft. gross.
CO	14·22	
H_2	43·73	
CH_4	24·04	
N_2	11·19	
	100·00	

There has never been any restriction imposed by law on the percentage of CO permissible in gas. The Departmental Committee on Carbon Monoxide reported in 1921: "That it is not necessary or desirable to prescribe any limitations of the proportion of carbon monoxide which may be used in gas supplied for domestic purposes." The medical evidence before this Committee was in favour of a limitation. Dr. Stevenson, in his evidence, pointed out that the death-rate from coal-gas poisoning for towns where water gas was supplied was 2½ times higher than in towns in which none was supplied. In two large towns adjacent to each other, the rates were 3·5 per million and 0; the first was supplied with 25 p.ct. of water gas, and none was supplied to the second. In America the use of water gas is almost universal—even 100 p.ct. in some cases—and the death rates from gas poisoning range from 7·3 per million for places supplied with coal gas alone to 59·3 per million in places supplied with 50 to 100 p.ct. water gas (ref. 3). It appears, therefore, since the number of deaths from gas poisoning varies with the percentage of CO in the gas, that accidental leakages are more deadly when the gas contains a high percentage of CO.

PRODUCTS OF COMBUSTION.

The products of perfect combustion of coal gas should be carbon dioxide and water, with a little SO_2 and SO_3 from traces of sulphur present. It is only in the event of imperfect combustion that carbon monoxide is evolved.

Using gas of calorific value of 540 B.Th.U. net, Rideal (ref. 11) obtained from each cubic foot of gas burnt 295 grains of water and 0·6 c.ft. of CO_2. He gives tables (p. 62) showing the relative amount of heat, water, and CO_2 produced by gas-lamps and men.

Owens shows (ref. 6) that with condensing flueless stoves there was a rapid increase in the amount of CO_2 in the air of the room, which in six cases tested rose from about 6 parts in 10,000 to from 15·5 to over 30. In the case of one of these he found 0·012 p.ct. of CO in the room, and 0·03 p.ct. immediately over the hood. With other condensing stoves no CO was found.

Carbon Dioxide; Hygienic Importance.—CO_2 is harmless if pure, and if it does not approach the average percentage in air exhaled from the lungs—that is, 4·3 p.ct. Workers in aerated-water factories breathe air having up to 3 p.ct. CO_2.

The only result of breathing 0·5 p.ct. CO_2 is a slight and unnoticeable increase in the ventilation of the lungs, such as results from exercise. When the CO_2 percentage rises to over 3, hyperpnœa begins, and there might be slight headache. On breathing 5 to 6 p.ct., hyperpnœa is exhausting, the face flushes, there is sweating and headache. Breathing 10 p.ct. of CO_2 cannot be endured for more than a minute or so; there result headaches, sweating, dimness of vision, and tremors (ref. 15, p. 138).

Men in submarines remain submerged until the CO_2 reaches 3 p.ct. Men in breweries work for years in 1 to 2 p.ct. of CO_2. 2 p.ct. increases breathing about 50 p.ct.; 3 p.ct., about 100 p.ct.; and 5 p.ct., about 300 p.ct. (ref. 15, p. 139). There are many other cases on record where large percentages of CO_2 have been breathed with immunity.

Dr. Angus Smith found that 300 parts in 10,000 of CO_2 produced feebleness of circulation, slowed the heart, and quickened respiration; but he had no inconvenience with 20 in 10,000. Pettenkofer and Velt found no discomfort after long exposure to air containing 100 parts of CO_2 in 10,000. Haldane found no unpleasant quality with CO_2 from a paraffin lamp up to 75 per 10,000, whereas with Oxford town gas the air became unpleasant when the CO_2 reached 30 to 40 parts per 10,000; but this is attributed to the 8 or 9 grains of sulphur which may exist per cubic foot of gas.

Carbon Monoxide.—The late Prof. Vivian B. Lewes frequently protested against the sale of flueless gas-stoves (ref. 18). As bearing upon the contamination of the air when geysers or cooking stoves are at work, Prof. Lewes examined the products of combustion when a vessel containing water was being heated on a gas-flame; the vessel being placed first ½ in. above the inner cone of the flame, and secondly at the extreme outer tip. The results were as follows:

	Bunsen Flame.		Luminous Flame.	
	Inner.	Outer.	Inner.	Outer.
Nitrogen	75·75	79·17	77·52	69·41
Water vapour	13·47	14·29	11·80	19·24
Carbon dioxide	2·99	5·15	4·93	8·38
Carbon monoxide	3·69	*Nil*	2·45	2·58
Methane	0·51	0·31	0·95	0·39
Acetylene	0·04	*Nil*	0·27	*Nil*
	100·00	100·00	100·00	100·00

It is clear from this that, by impeding combustion with cool surfaces, a large quantity of carbon monoxide may pass away in the products.

Carbon monoxide poisoning is due to the want of oxygen, which is displaced from the blood. The hæmoglobin may become one-third saturated with CO without a man realizing anything is wrong, but if he exerts himself he collapses from oxygen want. CO has 200 times more affinity for hæmoglobin than oxygen, and it is dangerous to breathe for long an atmosphere containing 0·1 p.ct. 600 c.c. of CO are required to combine with the blood in order to produce prostration. Breathing 0·3 p.ct. for fifteen minutes at the normal rate will effect this. A man who has breathed 0·2 p.ct. for four or five hours, or 0·4 p.ct. for one hour, will generally die. Air containing 2 p.ct. to 5 p.ct. causes death almost as quickly as drowning (ref. 15).

Sulphur.—Probably the chief cause of the disagreeable effect of the products of combustion is the sulphur in the gas, and this appears to be discharged into the air in the form of sulphuric anhydride (SO_3) (ref. 15, p. 256). Prof. V. B. Lewes states (ref. 18, p. 158) that the sulphur in gas is liberated when the gas is burnt in the form of sulphur dioxide. Sulphuretted hydrogen is never produced by the burning of gas. Rideal says (ref. 13, p. 3) that one expects to find the sulphur in gas oxidized to sulphurous or sulphuric acid. It does not seem of great importance from the present point of view whether the acid formed is sulphurous or sulphuric, but one or other is formed, and there might be approximately 30 to 40 grains of sulphur per 100 c.ft. of gas (ref. 18, p. 158). Leonard Hill says (ref. 15, p. 256) that anhydrous sulphuric acid is formed from the sulphur of gas, and 1 part in 500,000 is irritating.

The Director of the "Lancet" laboratory, in the "Lancet" report on "Gaseous Fuel" (ref. 5) says that sulphur itself in burning gives sulphurous acid, but in the form in which it occurs in coal gas it burns nearly completely into sulphuric acid, and not into sulphurous acid, as generally supposed (p. 5). He states that, when water is boiled in a glass flask over a bunsen burner, a strongly acid liquor may be washed off, which gives all the reactions of sulphuric acid.

Rideal (ref. 13) gives a table showing the amount and composition of the water condensed by a flueless stove, burning gas, 1 c.ft. of which produces about 30 c.c. of water, or 1 fluid ounce, and contains 0·3 grains of sulphur.

	Hours.	C.Ft. Gas Burnt.	Water.		P.Ct.	Sulphur Oxides.		P.Ct.
			Formed.	Condensed.		Formed.	Condensed.	
			C.C.	C.C.		Grains.	Grains.	
1	3	19	564	20 8	3·7	5 7	0 2	3·5
2	4	33	979	45·0	9·9	9·9	0·46	4 6
3	4	28	831	3·7	39·3	8·4	2·54	30
4	4	32	949	143	15·1	9 6	0·94	10

It is clear from this that all the sulphur in the gas is not condensed in the water, and that the condensation of the sulphur acids is proportional to the quantity of water condensed.

(To be concluded.)

* The reporter usefully concludes the appendix with a list of the sources of his information. See next issue.

LOUGHBOROUGH GAS PROFITS.

Substantial financial results were reported at a meeting of the Loughborough Town Council, on Monday of last week, in relation to the past year's operations in connection with the gas undertaking; a gross profit having been made of £17,316, leaving, after payment of various charges, a balance to be carried forward of £6897. The capital account now stands at £152,281, having been increased during the period under review to the extent of £4302.

Dealing with the various details, Mr. Lloyd Jones, who moved the adoption of the report, said he thought the town had ample reason for congratulation in regard to the results achieved. On the revenue account, the expenditure had been below that of the previous year. A saving of £1704 had been effected on coal, but practically all the other items showed an increase. One new item of expenditure was represented by the maintenance of consumers' fittings, and the amount of this was likely to increase, as it was the policy of the Committee to develop this feature of their work. The gas sold during the year amounted to 147,244,300 c.ft., an increase of nearly 4 millions; but the receipts were down by £1098, on account of the reduction which had been made in price during the last seven months. The sale of residuals accounted for a substantial increase. Considering the state of trade in the town, and the reduction which had been made in the price, he thought the general results were very satisfactory. The Committee had decided that the price should be reduced again by 4½d. per 1000 c.ft., bringing it down to 1s. per therm. There would be further capital expenditure in the future, and more would have to be spent upon coal than was the case last year. With the completion of their offices and fitters' shops, they would have perfected arrangements which would not only be a credit to the Corporation, but would enable them to compare the Loughborough Works favourably with those of any others of their size in the country.

In the course of subsequent discussion, Mr. A. Y. M'Ghie suggested that, taking into consideration the whole of the facts, the town was justified in asking for a larger reduction in the price. Upon the profits made, he contended that consumers were entitled last year to a reduction of 6d. The extra 1½d. would only have absorbed £600, and could well have been afforded. The prospective capital charges might or might not be large, but to give back only £2800 out of the profits was, he argued, not enough. He thought, therefore, the Committee might still be asked to see whether they could not make the reduction 6d. at the very least. They ought not to go in for making profits; their object should be to supply gas at the lowest possible figure consistent with making ends meet. Mr. R. Spriggs expressed his agreement with these views, and thought the Committee, of which he was a member, might reasonably consider the question of price in September or October. The Chairman had hinted at big outlays and the removal of the works, but they were not making any more gas than three years ago.

Mr. Lloyd James, in reply, said the capacity of the plant was at present too limited, and extensions would have to be undertaken in the near future. He did not suggest that the works would be removed this year or next year, but it would be for the benefit of the town and the undertaking if such a course were ultimately adopted. Coal had gone up in price, and the Committee had been wise in making provision for supplies. They would have liked to reduce the price further, but had the interests of the town to consider.

The report was adopted.

SHEFFIELD GAS COMPANY'S IMPORTANT PURCHASES.

At an extraordinary general meeting of the shareholders of the Sheffield Gas Company sanction was given to the purchase of the Dronfield and the Handsworth Woodhouse gas undertakings. The prices agreed upon for the sale were: Dronfield, £20,600; and Handsworth Woodhouse, £23,000.

Lieut.-Col. H. K. Stephenson, D.S.O., who occupied the chair, said the Directors of the Sheffield Gas Company considered that the prices agreed upon were fair and reasonable to all parties. He mentioned that last year the profits of the Dronfield Gas Company were £1314, and of the Handsworth Woodhouse Company £3520. It was not their intention to raise any fresh capital for the purchases, for they had ample funds in hand for the purpose. Their object in taking over the two Companies was in order to extend the scope of the Sheffield Company. The Handsworth Woodhouse Company were actually within the Sheffield Company's area, and the Handsworth Company was only formed because the Sheffield Company in years gone by had not exercised the rights they possessed within that area. If the shareholders agreed to the purchase, he did not anticipate any objection to the scheme from the Board of Trade; and it was probable that their consent would be obtained by the autumn. Two months from the date of the issue of the Order by the Board of Trade, both undertakings would become the property of the Sheffield Gas Company. The Dronfield and Handsworth Woodhouse shareholders had unanimously approved of the scheme.

Replying to a question by Mr. B. Hobson as to whether the gas-mains would be connected up from Sheffield to the Dronfield and Handsworth Woodhouse undertakings, the Chairman said that matter was having the careful consideration of the Board of Directors. It was rather premature at present; and he was not prepared to say which method would be adopted. He considered it a profitable scheme, because the more gas they made the better they would be able to supply cheap gas to the public in those areas.

Mr. Hobson said a paper had been handed to him about electricity at Dronfield, but in that matter there was no reason for alarm. They had electricity in Sheffield, and yet the Gas Company still flourished.

Reduction in Price at Deal.—A reduction in the price of gas is announced by the Deal and Walmer Gas Company. The charge will be reduced from 11d. to 10·4d. per therm from the date of the meter readings for the June quarter.

TRADE NOTES.

"Nico" Gas Catalogue No. 117.

With reference to their gas catalogue No. 117, the New Inverted Incandescent Gas-Lamp Company, Ltd., intimate that, in consequence of increased cost of wages and materials, the prices of gas-fittings and small brass gas-fittings (pp. 54 to 126 inclusive) are advanced 5 p.ct. This advance will not apply to orders already booked. The prices of "Nico" burners and all other articles shown in the catalogue will remain unchanged.

The Whessoe Rotary Scrubber.

The Whessoe Foundry and Engineering Company, Ltd., No. 106, Cannon Street, E.C.4, have published a well-written and delightfully illustrated booklet dealing with their well-known scrubber. In view of the increasing tendency among gas engineers to adopt the rotary scrubber for the extraction of naphthalene, it may be mentioned that the Whessoe rotary is giving excellent service, having been largely adopted for this purpose by leading gas companies.

Allen-Liversidge, Ltd.

Owing to continued expansion of business, Messrs. Allen-Liversidge, Ltd., the well-known manufacturers of dissolved acetylene and acetylene welders' equipment, have found it necessary to move into larger and more convenient offices. The address of their Head Offices is now Victoria Station House, Westminster, S.W.1. The lighting, heating, and power installation department remains as before at No. 123, Victoria Street, Westminster, S.W.1, where the Company's showrooms will also be situated.

Barimar, Ltd.

Messrs. Barimar, Ltd., of Nos. 14 to 18, Lambs' Conduit Street, W.C.1, advise that they are daily receiving many inquiries as to whether certain parts of machinery, which have become fractured or worn, can be repaired. Frequently sketches are sent with these, and we have been asked by Messrs. Barimar to point out that, generally speaking, parts of all metals can be repaired by one or other of the Barimar processes, but a sketch does not, as a rule, afford sufficient information on which to base a quotation. The firm make a practice of quoting for repairs the same day as the parts are received, and the actual broken parts should be forwarded to the Barimar headquarters, or to the nearest Barimar Branch, for expert advice.

Large Order for Pulverized Fuel Plant for Birmingham.

The Vickers and International Combustion Engineering, Ltd., of Africa House, Kingsway, W.C. 2, have received an important order from the City of Birmingham Electricity Department for a complete pulverized fuel plant for the Nechells Power Station, to consist of the following: Six Vickers-Spearing boilers, each having 5400 sq. ft. of heating surface, to give superheated steam at 325 lbs. per sq. in. Four bunkers of steel plate construction, with the necessary sliding gates to receive the raw fuel and pass it to the dryers. Four gravity-type dryers, to reduce the moisture in the coal to about 5 p.ct. by utilizing the heat of the waste gases from the boiler flues. Four Raymond roller pulverizers each having six rolls, to pulverize the fuel to such fineness that 90 p.ct. will pass through a 100-mesh sieve and none be left on a 40-mesh sieve. Two compressors and apparatus to convey the fuel from the pulverizers to the bunkers above the boilers. Six groups of Lopulco feeders; and 24 Lopulco burners. This contract has been accepted by Vickers and International Combustion Engineering, Ltd., on strict efficiency guarantees, and for the use of fuel of low calorific value. It will doubtless be watched with interest, as it is the largest order that has as yet been placed in this country for pulverized fuel firing.

Hatfield Gas Works Sold.—At an auction conducted by Messrs. Shearman & Johnston, last Friday, the Hatfield, near Doncaster, Gas-Works were sold for £425, the purchaser being Mr. A. J. Wells, of Hatfield.

London County Council and the Sale of Coke.—At last week's meeting of the London County Council, the Chairman of the Public Control Committee (Mr. Cyril Jacobs) obtained leave to withdraw his Committee's report with reference to the sale of coke [*ante*, p. 544], in view of a communication which had been received from the Society of Coal Merchants stating that, while they were in favour of the sale of coke by weight, they desired to approach the Committee by deputation in order to explain their views. Mr. Jacobs promised to submit another report as soon as possible.

Meter Testing in Glasgow.—Reporting to the Glasgow City Magistrates upon the work of the Gas-Meter Testing Department for the year 1923, Mr. S. B. Langlands (the Inspector) says the total number of meters tested was 59,868, and the fees collected £3684, which figures constitute a record for the department. Of the total number of meters tested, 58,592 were new and repaired ones, and 1276 were sent in by consumers for certification as to correctness. There were 57,472 new and repaired meters correct and stamped, and 1120 were rejected. Of those sent in by consumers for certification 605 were correct and stamped, and 671 were rejected. Thus there were 1791 meters rejected, and of these 1001 were fast in registration and 438 slow.

Lampeter Gas Company.—Alderman Walter Davies presided at the annual meeting of the Lampeter Gas Company, when the annual report was presented, showing that the past year was not as good as anticipated, owing to rather heavy expenditure out of income on capital account. The balance for 1923 of £249 compared with £417 in 1922. Though the price of gas was reduced last year, the cost of coal increased from 36s. in 1922 to 37s. 6d. in 1923, and had again been increased by another 2s. The supply was, however, satisfactory, and more gas was made per ton than in 1922. The overdraft had been considerably reduced, and the financial position much improved as compared with 1922. The report stated that the improved position was due to the Manager (Mr. Griffin) and the staff, and thanks were extended to them.

WATFORD GAS ORDER.

Bulk Supply to Rickmansworth.

An inquiry into a Special Order promoted by the Watford Gas and Coke Company under section 10 of the Gas Regulation Act was held at Ebury Hall, Rickmansworth, on Friday, May 30, by Mr. H. C. Honey (Director of Gas Administration, Board of Trade).

The main object of the Order is to confirm an agreement made between the Watford Company and the Rickmansworth Urban District Council for the supply of gas in bulk by the Company to the Council for a period of 21 years. There was opposition to this by the Rickmansworth Trades Council and Labour Party (who claimed to be acting in the interests of the ratepayers), on the ground that the negotiations were not made sufficiently public, that the period of the agreement was too long, and that gas could be supplied more cheaply by the Rickmansworth Council if they manufactured it themselves. There was also opposition by the Hertfordshire County Council and the Watford Corporation, who asked for a clause to afford them protection in respect of damage to roads resulting from the bursting of high-pressure gas-mains; and by the Metropolitan Railway Country Estates, Ltd., who held that their rights under an agreement made between them and the Rickmansworth Council in regard to the supply of gas to houses on the Company's estates would be affected by the bulk supply agreement which it was proposed to confirm. The Watford Gas Company were represented by Mr. A. J. LEES (Messrs. Lees & Co., Parliamentary Agents); the Hertfordshire County Council by Mr. P. E. LONGMORE; the Watford Corporation by Mr. W. HUDSON (Town Clerk); the Estates Company by Mr. Walter T. MONCKTON; and the Trades Council and Labour Party by Mr. N. A. EWINS.

Mr. LEES said that the Watford Company were incorporated in 1871, and authorized to supply gas in Watford and Bushey, and obtained further powers in 1883 and 1906. Under the Company's Act of 1906 they were authorized to supply in bulk outside their area of supply; the period of any contract in this respect not to exceed seven years. This was the old model form of clause. The development of the undertaking had been very rapid, the make last year being 479 million c.ft., and they were in a very sound financial position. With regard to Rickmansworth, at one time the gas was supplied there by a company, but the Rickmansworth Urban District Council had purchased the undertaking by Act of Parliament in 1903, the cost being about £36,000, and they were authorized to supply in Rickmansworth and adjoining districts. The Rickmansworth Council's area of supply adjoined that of the Watford Company. From 1903 till 1916 the Council had supplied gas from their own works; but in the latter year it became evident that the works were not able to cope with the needs of the district for another winter, and that it would be necessary to extend them. Under the then existing war conditions, the Ministry of Munitions had refused to grant the necessary permission, and had told the Council to obtain a supply from outside sources. Negotiations were therefore carried on between the Council and the Watford Company, with the result that an agreement was entered into for the supply of gas in bulk to the Council from Oct. 1, 1917, for a period of seven years—this being the longest period for which the Company could take a contract under the provisions of their Act of 1906. The price to be paid by the Council was the current price to the ordinary consumers in the Watford Company's area, less 8d. per 1000 c.ft. At that time the price to the Watford consumers was 2s. 8d., so that the Council obtained the gas at 2s. There were also provisions for the Watford Company to lay mains in order to give the supply, and provide a station meter for measuring the gas; and these were to be taken over by the Rickmansworth Council at a depreciated rate when the agreement expired.

In reply to Mr. Honey, Mr. Lees said the present price in Rickmansworth was 14d. per therm, and in Watford 10d.

After the agreement was made, continued Mr. Lees, the price in Watford went up as the result of war conditions. At the time the agreement was made, the 8d. differential represented a 25 p.ct. discount on the rate at which gas was supplied to Watford consumers; but, as the price increased, this discount became a decreased one. The Council had brought the matter before the Company, with the result that during the last four years the Company had voluntarily increased the discount from 8d. to 1s. per 1000 c.ft. Early in 1918 a further agreement was entered into, under which it was provided that the Company should operate temporarily the existing gas-works of the Council—the agreement to remain in force until six months after the signing of a general treaty of peace, if the bulk supply agreement were then operative. The agreement with regard to the operation of the works expired on Feb. 28, 1922. In pursuance of the agreement, the Company operated the Rickmansworth Gas-Works, and manufactured gas to supplement the gas supplied in bulk, and, as a matter of fact, were manufacturing gas at these works to-day, and supplying gas in bulk under the 1917 agreement. In view of the fact that the bulk supply agreement was to expire on Sept. 30, the Rickmansworth Council had to consider the course to be adopted in the future. They had called in Mr. George Evetts to advise them, first, as to the disposal of the whole gas undertaking, secondly, as to the resumption by the Council of the manufacture of gas at their own works from Oct. 1; and thirdly, as to the advisability of endeavouring to negotiate a fresh agreement with the Watford Company for a supply in bulk. As the result of Mr. Evett's report, the Council had decided to negotiate with the Watford Company.

Mr. LEES then gave details of the negotiations, which were spread over several months. As a result of a meeting between representatives of the Council and the Company, the heads of an agreement were drawn up and submitted to the Gas Committee of the Council on Sept. 6, 1923. Further meetings and discussions took place from time to time, and on Nov. 8, 1923, the Council had resolved unanimously that instructions be given to prepare the formal agreement. The terms were that the Company should construct such works as were necessary to give the Rickmansworth Council a complete supply of gas for the whole of their area, at a price equal to that charged to the ordinary consumers of Watford, less 26½ p.ct. discount. Also, the Company were to build a new gasholder at the Rickmansworth Works, and lay a new high-pressure main from the Watford Gas-Works to the Rickmansworth Works, and to supply gas for 21 years. At the expiration of the agreement, the Council were to take over their own works, and purchase the holder, and so much of the main as was within the Rickmansworth area of supply, at cost price, less depreciation—the terms of which were agreed. The agreement was drafted, and put before a meeting of the Council held on Feb. 14. On this occasion a member of the Council had submitted a statement of the cost of manufacturing gas at Rickmansworth, based on figures supplied to him by Mr. John Welch (the Works Manager of the Rickmansworth Gas-Works), and moved that, in the interests of ratepayers and gas consumers, the Council should abandon the proposal to take gas in bulk from the Watford Company. No seconder was found for this motion, but the Council had referred the statement to Mr. Evetts (the Consulting Engineer). He had found that the figures were substantially true so far as they went, but did not represent the real cost of production of gas at Rickmansworth. The calculation was based on the demand in one of the maximum weeks, when the cost of labour per thousand c.ft. was obviously lower than the average for a full year, the carbonizing results were of a favourable character, and, in addition, the gas was made in retorts which were reset last summer. Only a very small charge was added for maintenance of the undertaking, and nothing included for repairs and renewals of the plant. No coal stocks had been checked, and no consideration was given to the loan charges and other expenditure of this nature. In addition to all this, the statement had compared the price at which it was said gas could be made at the Rickmansworth Works with a price of 3s. 7d. per 1000 c.ft., as though this were the price the Council were going to pay to Watford, whereas the price under the agreement would be 3s. 0⅜d. After Mr. Evetts had commented upon the statement, the Council, on March 13, approved the agreement with the Watford Company, and the agreement was sealed at a special meeting of the Council on April 10, at which there were present eight out of the twelve members. All present, with one exception, voted in favour of sealing; the one exception being the member who had handed-in the statement already referred to.

Mr. Lees then went into the details of the agreement, which takes effect from Oct. 1, for 21 years. In addition to the high-pressure main and boosting plant from the Watford Works to the Rickmansworth Works, and a suitable station meter and gasholder at the latter works, provision is made for the Company, subject to the Council's consent, to supplement them by the provision of other necessary mains, pipes, and apparatus, and to supply cookers, fires, and other consumers' apparatus required by the Council. The pressure to be maintained is 80-10ths at the point of delivery to the Council's gas works. On the termination of the agreement, the Council are to repay to the Company the cost of the high-pressure main within the Council's district, the station meter and gasholder, and so much of all other meters, gasholders, mains, pipes, and apparatus as have been provided by the Company within the Council's district, less depreciation. The depreciation, to be reckoned on the gross original cost, is as follows:

Steel mains	at 5 p.ct.	per annum
Cast-iron mains and pipes	at 3½ p.ct.	,, ,,
Gasholders	at 3⅓ p.ct.	,, ,,
Station meters	at 5 p.ct.	,, ,,
Meters, cookers, and fires	at 10 p.ct.	,, ,,

The amount of depreciation to be applied to any other apparatus supplied by the Company to the Council shall be at an agreed rate, or failing agreement shall be settled by arbitration. The Company are authorized to supplement the supply by making gas at the Council's works, on terms and conditions laid down. Among these is a provision that, during the period of such a supplementary supply, the Company shall pay the Council £200 per annum towards the rent, rates, and taxes in respect of the Council's works. During such period, the Company are to execute repairs necessary for the upkeep of the works, with the consent of, and at the cost of, the Council; but retorts, retort-houses, purifiers, exhausters, and working machinery used in such supplemental manufacture shall be kept in repair (fair wear and tear excepted) by the Company at their own expense. When supplemental manufacture is not carried out by the Company, they are to have the use and sole control of so much of the works as is necessary to enable them to carry out the agreement, free of all rent, rates, and taxes. Works done by the Company in the Council's area, in execution of the agreement, shall be subject to the approval of the Council.

As evidence of the feeling of the electors in this matter, Mr. Lees said that, five days before the agreement was sealed, there was an election of councillors; three of the Council having retired and stood for re-election. They had issued a letter in the Press pointing out that the Council had been investigating the problem of the supply of gas from Watford for a year past, had made an agreement with the Watford Company which they considered to be a good bargain, and that the Council's opinion was confirmed by an expert. There was also a new candidate for election, who was Mr. Welch (the Works Manager at the Rickmansworth Works), and he issued a statement expressing disapproval of the Council's action, maintaining that, with two additional settings of retorts, the whole of the gas required for the Council's area of supply could be made by the Council at their own works, and that the consumers could be supplied more cheaply by the Council. The result of the election was that the three retiring councillors were re-elected, and Mr. Welch was not elected.

Dealing with the objections, Mr. Lees turned first to that of the Metropolitan Railway Country Estates, Ltd. This Company had entered into an agreement with the Council in February, 1922, under which it was provided that the Company would lay certain mains in roads on their estates, and that the Council were to supply gas to these mains. The cost of the mains was agreed at £2629. The agreement provided that, if in any year it was found that there had been supplied to consumers from these mains such a quantity of gas as would yield to the Council a "profit revenue" equivalent to 8 p.ct. of the £2629, the Council were to pay to the Company the cost of the mains. If, however, more than five years elapsed before the Council had earned

the 8 p.ct. from these mains, allowance was to be made for depreciation. The suggestion was that the agreement made between the Council and the Watford Company for the supply in bulk would destroy the chances of the Estates Company of getting their money back, because there would be no chance of the Council's earning the 8 p.ct. Mr. Lees maintained however, that if the bargain made by the Council for supply in bulk was a good one, then the Estates Company should get their money back sooner than otherwise. The Hertfordshire County Council and the Watford Corporation asked for protection in respect of damage caused to roads by reason of the bursting of high-pressure mains. Mr. Lees said the objectors were afraid of the expression "high-pressure main" in the Order; and if the promoters had merely called the main in question a "main" he did not think the point would have arisen. He considered that the County Council and the Corporation were needlessly alarmed, because there were high-pressure mains all over the country, and, so far as he knew, not one of them had ever been blown up. Also, the pressure in the particular high-pressure main referred to in the Order was less than the pressure in the water mains of the Corporation. About three weeks ago a main belonging to the Colne Valley Water Company had burst and damaged a road; and he could not help thinking that this had led to the objections to the present Order. The high-pressure gas main would be laid and maintained in accordance with the provisions of the Gas-Works Clauses Act; and he also pointed out that the Rickmansworth Council and the Watford Company could, under their present powers, lay a high-pressure main in their areas if they desired. Therefore, no special provisions should be made in regard to this particular main. There was also an application by Mr. John Welch for the insertion of a compensation clause in the Order, which would ensure his receiving adequate compensation in the event of losing his employment for reasons other than incompetence or misconduct. He stated that he had been in sole charge of the Rickmansworth Works for eighteen years, and in the course of his employment had sustained injuries of such a nature as to preclude him from carrying out manual labour. Mr. Lees submitted that this was not a matter which arose on this Order. In reply to Mr. Honey, he said there was no proposal on the part of the Company to discharge any employees.

Mr. *W. E. Catesby* (Chairman of the Rickmansworth Urban District Council, and who was Chairman of the Gas Committee during the period when the negotiations were conducted with the Watford Company) confirmed Mr. Lees opening statement, and said he was satisfied that the arrangement would be to the benefit of the town. At first the Watford Company had offered to supply at a price representing a discount of 25 p.ct. on the Watford price; but he had been a member of a deputation to the Company which had succeeded in securing a discount of 26¼ p.ct. He was satisfied that the Council had wrung the last halfpenny out of the Company.

Mr. EWINS (for the Trades Council and Labour Party) cross-examined, to bring out the fact that the figures submitted by the Council's Consulting Engineer were not made public.

Witness, however, pointed out that it was natural that when the Council were driving a bargain they should not tell everybody about it. A leaflet had been published, giving some of the facts, as soon as it was possible to do so. Witness agreed that, when the Council had purchased the gas-works in 1903, the permission of the ratepayers was obtained, because it had to be in order to promote the Bill.

Mr. *J. J. Middleton*, F.S.A.A. (Chairman of the Gas Committee of the Council), was also satisfied that the agreement was a good one, and handed in a table dealing with the cost of supply by the Rickmansworth undertaking, under the existing arrangement of receiving gas in bulk from the Watford Company. It showed that the average price at which gas had to be sold in order to avoid a deficit was 7s. 7d. per 1000 c.ft. in 1920-21; 7s. 10¾d. in 1921-22; and 6s. 10¾d. in 1922-23. The Council would do better for themselves if the new agreement were confirmed than they could do if they took over their own works in October and manufactured gas The agreement would give security as to supply as well as to costs.

Cross-examined by Mr. Ewins, who suggested that the period of the agreement should be shorter than 21 years, Mr. Middleton said that this was the wish of the Council, but the Company would have to spend a large capital sum in consequence of the agreement, and it would not have been possible to get the same terms if the period were shorter.

Mr. *George Evetts* (Consulting Engineer), after expressing his satisfaction that the terms arranged represented a substantial benefit to the Rickmansworth consumers, as contrasted with the alternative of the resumption of gas manufacture by the Council, said that the Rickmansworth Works could not without extension supply the whole demand in the area. The principal loans on the undertaking would not be repaid for another ten or eleven years, and if the undertaking were saddled with further capital expenditure before the repayment of existing loans, the total loan charges would be very heavy. Witness dealt with the capacity of the plant at the Watford Company's works, which, he said, could deal with the bulk supply to Rickmansworth without prejudice to the Watford consumers. When consulted in regard to the Rickmansworth Works, he had reported against selling them entirely, in view of the rapid development of the district, because, when the principal loan was paid off, the undertaking would be a very successful one. Coupled with that, there was the sentimental attraction of keeping their own gas undertaking. With regard to the expenditure which would have to be incurred if the Council were to undertake the manufacture of gas at their own works, he had reported that in the next few years they would have to spend £9000 or £10,000; but even this would not provide them with a nucleus of a works which would be of any value in ten or fifteen years' time. This expenditure would merely provide for a patching-up of the existing works. They were also faced with a capital expenditure on distribution. Therefore he had recommended that, if the Council could obtain a supply from Watford at a 25 p.ct. discount, and the Company provided the capital for a period of 21 years, the Council would be in a better position than if they manufactured gas themselves. But they had obtained a discount of 26¼ p.ct. The present charge in Watford was 10d. per therm, and Rickmansworth would buy at 7·35d.; and he could not see how the Council's undertaking could get gas into the holder at that price if they had to pay capital charges. Under the agreement, the works carried out in connection with the undertaking by the Watford Company would be taken over eventually by the Rickmansworth Council at a low rate. A gasholder of 190,000 c.ft. capacity was the largest they could get on the existing site at Rickmansworth. The estimated cost of this, with foundations, was £7250; but the Council, at the end of 21 years, would acquire it, under the agreement, at about £2200. Thus the Watford Company would pay the interest on capital for 21 years, and lose the £5000 as well. An attractive feature, from the Rickmansworth Council's point of view, was that the depreciation figure for the various items was based on an estimated life which was less than the actual life was likely to be. The holder was depreciated on the basis of a 30 years' life, but its actual life would be 70 or 80 years, so that Rickmansworth would acquire a holder with about 50 years life in it, at 30 p.ct. of the original cost. Again, he estimated that the Watford Company would pay £2500 for the high-pressure main, but the Rickmansworth Council would get it for nothing in 21 years. He would not say what the life of the main (which would be steel) was likely to be; but in France he had seen them 30 years old. The station meter, which would cost about £1000, they would get for nothing; and the life of a station meter was more than 21 years. Similar remarks applied to stoves and meters provided by the Watford Company, and these advantages were very substantial. He estimated that the Watford Company would spend £25,000 during the period of the agreement, and they would receive back £4280 on the basis of the agreement. In addition, the Company had already spent £5017, for which the Council would pay £800 at the end of the period; so that the net result would be nearly £25,000 capital expenditure for which the Council would not be liable—more than £1000 a year.

Mr. Evetts handed-in a table giving details of the plant required up to 1933 (based on an estimated growth of the demand from 52 millions in 1923 to 111·8 millions in 1933, if the whole demand were to be met by the Rickmansworth Works. The cost at that date he estimated at £25,270.

Replying to Mr. Longmore, who cross-examined, Mr. Evetts said he could not conceive of the high-pressure main bursting. When it was suggested that, in those circumstances, it would do the Watford Company no harm to grant the County Council a protective clause, witness drew a distinction between damage due to a burst and damage following an explosion due to leakage. The latter might be due to circumstances absolutely beyond the control of the Gas Company

Cross-examining on behalf of the Watford Corporation, Mr. Hudson pointed out that the Watford Corporation had powers to erect new works on a site a considerable distance from their existing works, and asked whether at any time during the period of the agreement it would be necessary to continue the high-pressure main through about two miles of the Borough to the new site. Mr. Evetts replied that it was impossible to say.

It was then put to Mr. Evetts by Mr. Ewins that an expenditure of £6000 would enable the Rickmansworth Council to cope with the demand from their works up to 1930; but Mr. Evetts said this was ridiculous. To a suggestion that he had over-estimated the probable life of meters and stoves, he said that the meter in his own house was repaired—not bought—seventeen years ago, and was still in good order, while his stove, which was bought fifteen years ago, was still in very good condition.

In re-examination, Mr. Evetts said he had never heard of a case in which a road authority had asked for protection against damage due to the bursting of a high-pressure gas-main. Even if there were an explosion, he could not conceive how it could be said definitely that it was due to a burst.

There was a short interval for lunch, in the course of which Mr. Honey found time to pay a visit to the Rickmansworth Works.

Mr. *J. W. Buckley* (Engineer and General Manager of the Hornsey Gas Company) gave evidence, and handed-in an estimate of plant which would be required to enable the Rickmansworth Works to supply the demand. He had based his estimate on the same rate of growth as had Mr Evetts, and the cost up to 1927 he gave as £25,750. In his case he had allowed a figure of 7000 c.ft. at the mouthpiece of each retort, whereas Mr Evetts had allowed a slightly higher figure, in order to be fair to the opposition. The figure of 7000 c.ft. he regarded as a liberal allowance; for it was impossible, under modern conditions of working, to expect a higher figure. There was no room for further extensions in the retort-house, but if the arrangements for a bulk supply were not renewed, very large extensions would be necessary, and they would have to be done immediately, in case the supply from Watford were cut off. Even in 1924 the Council would require to spend £3350. The figure of £6000, put forward as being sufficient to carry the undertaking on until 1930 was, he agreed, ridiculous.

Cross-examined by Mr. Longmore, who suggested that modern traffic conditions made it necessary to carry out repairs to mains more frequently than was the case ten or fifteen years ago, witness said there was a little tendency in that direction, but there was not much definite evidence. Of course, gas undertakers took proper precautions.

This completed the case for the promoters.

Mr. LONGMORE then adddressed Mr. Honey on behalf of the Hertfordshire County Council, and, in the first place, took the opportunity of saying that the County Council were of opinion that the Rickmansworth Council had come to a very satisfactory agreement with the Watford Company, and considered it was better for the efficiency of gas supply that there should be fewer works, but of larger capacity, rather than a large number of small works all over the place. As to the protection asked for by the County Council, he drew attention to the distinction drawn by Mr. Evetts between a burst and an explosion caused by leakage, and said the County Council required protection against damage from either cause. The clause which he suggested should be inserted was as follows:

> "The Company shall make compensation to the County Council of the County of Hertford and the Corporation of Watford for any damage, injury, or loss suffered by the said Council or the Corporation, and for any expense reasonably incurred by them, by reason or in consequence of the leaking, bursting, or giving-way of any of the Company's works."

If damage were caused to the roads at present, he said, through an explosion, unless the road authority could prove negligence on the part of the gas undertakers, they had to restore the road themselves, under the general law; and it was most difficult to prove negligence on the part of a gas or other statutory company. As to the bursting of a water main at Bushey recently, he quoted this in aid of his case, because the County Council had had to repair the road themselves, the ultimate cost of which would be between £350 and £400. The reason for the explosion may not have been negligence; the point was that the main was there. He asked Mr. Honey to consider whether the time had not arrived for the law on the whole question as to responsibility for damage caused to roads by explosions—not only in the mains themselves, but from leakage—to be radically altered, and for the onus of proof in regard to negligence to be put on the owners of the mains rather than on the highway authority. His reason for putting this forward was that, since the Gas-Works Clauses Act, 1847, was passed, the problem of traffic had changed entirely, and the cost of road maintenance had increased enormously. As to a precedent for his suggested clause, he confessed that, so far as gas companies were concerned, he had been unable to find any precedent for its insertion in their Acts. But there had been numerous cases in which such a clause for the protection of a highway authority had been inserted in Water Acts, though he agreed that a water main was more likely to burst than a gas-main. The Manchester Corporation Act, relating to water, was a case in which such a clause was inserted.

Mr. LEES pointed out that it had reference to an aqueduct in that case, and was inserted by agreement, and not in accordance with the decision of a Parliamentary Committee.

Mr. HUDSON, for the Watford Corporation, said the high-pressure main for the supply of Rickmansworth would run for part of its length along a road which the Watford Corporation had recently widened and reconstructed at considerable expense. He did not mind admitting at once that perhaps the burst at Bushey had called the attention of the Corporation more particularly to the danger with regard to these pipes in public highways; but he did not go so far as to ask for an alteration of the general law. The particular high-pressure main he was concerned about was merely for the supply to Rickmansworth, and in all probability it would never be of any use to Watford. The position was that the Corporation were to allow to be laid through a reconstructed road a pipe which might be a source of danger, and which might cause an explosion and wreck a portion of the road; and when the Corporation went to the ratepayers to foot the bill, they would ask whether, when the Gas Company obtained this Order, the Corporation had taken steps to obtain protection.

Mr. MONCKTON then dealt with the agreement between the Metropolitan Railway Country Estates, Ltd., and the Rickmansworth Council. He maintained that the agreement between the Watford Company and the Council would enhance the risk of the Estate Company with regard to recovering the cost of the mains they had provided, and suggested that the Council should give some sort of undertaking that would cover that risk. This might be effected by alteration of the terms of the agreement.

Mr. HONEY could not see any foundation for asking for a fresh agreement; but if there were ground for a fresh agreement, why not ask the Council to make another?

Mr. MONCKTON replied that the agreement with regard to bulk supply would prejudicially affect the rights of the Estates Company under their own agreement, and they claimed protection.

Mr. EWINS then put the case for the Rickmansworth Trades Council and Labour Party, who, he said, opposed because the matter had not been made sufficiently public, and because they were of opinion that the Council could make gas at their own works and supply more cheaply than would be the case under the proposed agreement. At the same time he had been asked to make it clear that the Trades Council and Labour Party were convinced that the Council had acted throughout in the interests of the consumers, but that in this case they were mistaken. Protest meetings of the ratepayers had been held, at which resolutions against the proposal were carried more or less unanimously, and a petition had been signed by a large number of ratepayers protesting against the proposals; at least 90 p.ct. of the local tradespeople had signed it. Mr. Welch had estimated, he said, that the consumption in Rickmansworth in 1925 would be 57 million c.ft., and that the present plant at Rickmansworth could produce 50 to 53 millions. If the works were not used for the manufacture of gas during the 21 years covered by the agreement, they would be of little value afterwards unless a good deal of money was spent during that period to keep the plant in such a condition that it could be used when required. Again, the Watford Company, if they used the works for manufacturing gas, had to pay £200 a year; but if they were not manufacturing gas they would pay nothing, and it was conceivable that they might make use of the whole site and pay nothing. Insurances and upkeep also had to be paid by the Council during the period of the agreement.

Mr. *John Welch* (Works Manager at the Rickmansworth Gas-Works) said that under proper and economical management gas could be manufactured at Rickmansworth at a cost of 2s. 3d. per 1000 c.ft., whereas under the agreement the Council would have to pay 3s. 1d. to the Watford Company, according to the present price in Watford. His figure included ordinary running repairs, but not renewals. He also put forward the figure of £6000, already mentioned, as being the amount necessary to be spent on the works to meet the demand up to 1930.

Details of the manner in which this amount was arrived at were given by Mr. Welch, but Mr. Lees had some difficulty in finding out what they really represented. Mr. Welch said he had obtained tenders from well-known firms. Mr. Lees eventually discovered that the plant it was proposed to provide was second-hand.

Mr. *H. W. James* (Secretary of the Trades Council and Labour Party) gave evidence with regard to a canvass he had made in the town when preparing the petition protesting against the Council's proposal to enter into the agreement with the Watford Company. He said it was the desire of the ratepayers, in whose interests he had acted, that the gas supply should be in the hands of the Council.

Mr. HONEY asked questions to find out whether the signatories to the petition attached such importance to the Council's running their own gas-works that they did not care what they paid for the gas, or whether they regarded it merely as a matter of business.

Witness replied that it was a matter of business. If the Council ran their own works, the consumers must get gas more cheaply than under the proposed arrangements, because the Watford Company had to make a second profit. Also, there would be more employment in Rickmansworth.

Mr. HONEY said it appeared that they had no confidence in the Council.

Witness did not agree to this, but suggested that there was some influence behind the members of the Council.

Mr. *C. Weiss, A.M.Inst.C.E.* (a member of the Rickmansworth Labour Party), supported the objection, and considered that one great mistake the Council had made was that they had never had an expert gas or chemical engineer to run the works economically and on modern lines. He felt that, for a moderate outlay, the Rickmansworth Works could be made to cope with the demand.

Mr. LEES, in cross-examination, referring to a statement that, under the proposed arrangement, assuming the distribution costs in Rickmansworth remained as at present, the cost of gas to the Rickmansworth consumer would be nearly 8d. per 1000 c.ft. more than the cost to the Watford consumer, pointed out that in 1914 the Rickmansworth consumer paid 1s. 6d. more.

Mr. *W. M. Bowring* (who was described as a tanner, and a consumer of a reasonably large quantity of gas in Rickmansworth) supported the objection. If the proposed agreement were for a period of seven years, the proposition would perhaps be a good one. He took the opportunity of asking if there were a possibility of getting gas at an adequate pressure and a proper price in Rickmansworth, because, since 1916, he had had a wretched supply, at a poor pressure, and his employees were idle because his gas-engine had stopped on several occasions.

Mr. *A. Freeman* (Surveyor and Gas Manager, Rickmansworth Urban District Council) said that no complaints had been received from Mr. Bowring since a larger service had been put into his works recently, and blamed the condition of the engine for the bad results obtained.

The last report of the Gas Examiner was handed by Mr. Longmore to Mr. Honey, who remarked that the calorific value of the gas was 500 B.Th.U., and added that perhaps it was too rich for the engine.

Mr. *J. Sadler* (Chairman of the Trades Council and Labour Party) said that he had presided over the protest meetings referred to, and that local feeling was against the proposed agreement. A point he made was that there was no control over the price in Watford, and, if that went up, the price in Rickmansworth went up. The only consolation to Rickmansworth consumers would be that the price in Watford would go up as well as that in Rickmansworth.

Mr. HONEY pointed out that the price in Watford might go down, and, if witness were looking for consolation, he should not exclude that possibility.

Mr. LEES, in his summing-up, confined himself merely to the protection asked for by the Hertfordshire County Council and the Watford Corporation. He discussed the general law relating to damage caused by mains, and said he felt sure Mr. Honey would not make a special exception in this case simply because a water main had burst and had involved the County Council in an expenditure of £350 to repair the damage to the road. So far as he knew, there was no case of a private Bill where a Parliamentary Committee had decided that even water undertakers should be responsible for damage to roads through the bursting of a water main. In regard to the arrangement with the Watford Company, he had purposely called Mr. Buckley, because he was Manager of the Company supplying the cheapest gas in London. His evidence was conclusive that the Rickmansworth consumers would be better off with this agreement than without it, and Mr. Lees pointed out that Mr. Buckley had not been asked a single question by anyone with regard to his figures

Mr. *Welch* then made his formal application for the insertion of a clause in the Order giving him compensation in the event of dismissal for reasons other than misconduct or incompetence.

There was some little difficulty in deciding exactly what Mr. Welch's position was in this matter. Previously he had been employed by the Rickmansworth Council, but for the last 6½ years he had been employed by the Watford Company. On the other hand, he was one of the objectors to the present arrangement between the Watford Company and the Rickmansworth Council, and Mr. Honey pointed out that if, as a result of that objection, the agreement were not confirmed, then Mr. Welch would probably be out of employment.

The inquiry then closed.

Incombustible Matter in Coal.—The London County Council have adopted the following motion by Mr. J. P. Blake, seconded by Mr. W. L. Clague: "That it be referred to the Public Control Committee to consider and report whether or not the Council should seek powers in the next General Powers Bill to prevent slate, slack, or any incombustible matter being sold to the public as coal, or coal being sold of an inferior quality to that ordered."

Malta and Mediterranean Gas Company, Ltd.—At the annual meeting next Tuesday (June 17) the Directors will submit the accounts for the year ended March 31, showing that, after appropriating the sum of £4000 to reserve, the amount standing to the credit of profit and loss account is £13,198. The Directors propose the payment of the dividends on the first and second preference capital, and a dividend of 3½ p.ct. (free of income-tax) on the ordinary capital, making with the interim dividend paid in December last 6 p.ct. for the year, leaving a balance of £8846 to be carried forward. The Board announce with deep regret the death of Mr. Arthur Frederick Phillips, M.Inst.C.E., who had been a Director of the Company for the past twenty years. They have elected Mr. Arthur Matthews Paddon, M.Inst.C.E., to the office of Chairman, and Mr. Ernest Lionel Burton, F.S.A.A., to the vacancy on the Board. Subject to the confirmation of the shareholders, the Board, under the powers vested in them, have appointed provisionally Mr. Hyde Clarke Burton, A.C.A., as Auditor, to fill the vacancy created by the resignation of Mr. E. L. Burton.

THE NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

The market shows no sign of improvement, and the Whitsun Holiday, and consequent curtailment of production, is welcomed. It is hoped that tonnage will accumulate, to give the pits a good start after the breach. As it is, idle time has been rife. The market has been quite bare of trade, or even of serious inquiry. Contractors have not been able to find buyers at any price for the coal they hold, so that even those collieries which on paper are fairly well sold have a big struggle to keep going. Quotations for gas coals are nominally about 23s. 6d. to 24s. 6d. f.o.b. for Wear Specials, and 22s. 6d. to 23s. for best qualities. But those prices cannot be obtained, and for prompt shipment considerable concessions are obtainable both from collieries and contractors. Seconds are weak at 20s. to 21s.

Sellers are taking the view that the slump is of a temporary nature, and they cannot fix up forward business, because prices which might fetch it to-day would be below the cost of production.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

Some of the smaller gas undertakings are fixing up new contracts at 1s. to 1s. 6d. advance on the old rates. The big buyers are watching the course of events and testing the market at different points, but are in no hurry to commit themselves. Prices applying to spot lots are very irregular. The weakness in that direction encourages buyers to hope they may be able to make contracts on more favourable terms than seemed probable a little while ago. Nevertheless, the balance of opinion inclines to the conclusion that gas producers will not be able to escape some share of the increased cost of getting which the higher wages involve. The general trade remains very slack. Output has been suspended during the greater part of the current week. It will not be missed, however, for practically all the pits had previously been reduced to short time owing to accumulation of stocks. Even if accommodation were sufficient, financial considerations would not admit of piling-up stocks against the "squeeze" which is more than likely to occur later on. Prices of house coals are still weakening, the volume of business being very small. It looks as if at the less economically favoured collieries the miners may lose as much in earnings as they gain in wage rates, owing to diversion of business to districts where coal can be got at smaller expense. This tendency is already discernible.

Furnace coke is plentiful. While supplies are increasing, demand is decreasing. A blast furnace in the Black Country has been damped down for lack of orders.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

Gas coals in Yorkshire and Lancashire are at present in advance of last year's figures, but whether or not prices will be maintained is purely a matter for conjecture. There is practically no demand for house coal, in view of the Whitsuntide holidays. Owing to the settlement of the German strike, there is little inquiry for coal for shipment, and prices rule accordingly. Consumers of industrial coal are using up the stocks they accumulated in March and April.

Prices at Hull at the week-end were as follows: Bunkers: Yorks, Derby, and Notts large screened steam, f.o.b. Humber ports, 22s 6d. to 23s. Cargo for export, f.o.b. usual shipping ports: Best Yorkshire hards, Association, 25s. 9d.; Derby best hards, 25s. to 25s. 6d.; West Yorkshire Hartleys, 22s. to 24s.; South Yorks washed doubles, 24s.; ditto washed singles, 24s.; dry doubles, 18s. 6d.; South Yorks washed smalls, 18s. 3d.; Derby slack, 1 in., 15s.; South Yorks rough slack, 15s. 6d.; gas coke, 35s. 6d. to 36s.; foundry furnace coke, 26s. to 28s.; washed smithy peas, 26s. 6d. to 28s. 6d.; washed steam thirds, 23s.; South Yorks washed trebles, 24s. per ton.

In Lancashire prices are unchanged theoretically, but in practice fuel is from 3s. to 5s. cheaper than it was before all danger of the strike was removed.

Scarborough Capital Issue Over-Subscribed.—The issue by the Scarborough Gas Company of 5 p.ct. mortgages, to the amount of £35,750, offered for sale by tender at a minimum price of par, and advertised in our columns a short time ago, has been considerably over-subscribed; the bulk of the allotments being made at a premium.

Trading Departments and the Rates at Coventry.—At a recent meeting of the Coventry City Council, the minutes of a conference were submitted which was held in pursuance of an instruction of the Council of March 25 last, when the following recommendations of the Estates and Finance Committee were considered: "(1) That the Council approve of the adoption of the principle that, as the ratepayers stand to the trading undertakings in the position of guarantors, and—as such—are liable to make losses good, the rates are entitled to receive from the trading undertakings contributions equivalent to those which guarantors would receive in ordinary commercial transactions, and that accordingly whenever trading undertakings are in a position to do so they should contribute to the rates such a sum as represents the ordinary commercial value of the guarantors' services. (2) That the Council also approve of the chairman and the chief officer of each of the trading committees meeting the Estates and Finance Committee, in order to confer upon and report on the method of applying the above principle, and upon other questions in regard to the relation between the trading undertakings and the general body of ratepayers." The Council decided that paragraph (1) should not be adopted, but left to be discussed at the conference mentioned in paragraph (2).

GAS REGULATION ACT, 1920.

BOYS' CALORIMETER

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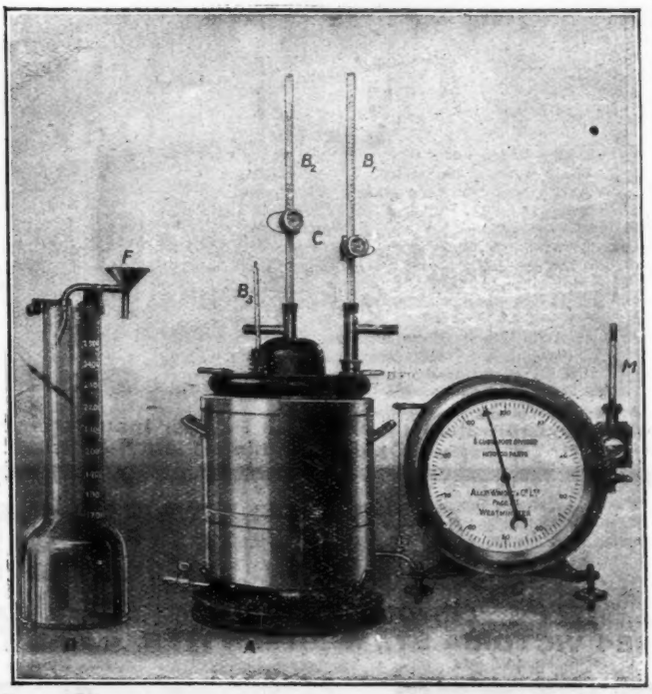

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate of Ammonia.

LONDON, *June 7.*

There is practically no change to report in the position of pitch, and in the absence of business the price is nominal. Creosote is a quiet market at about 8d. per gallon. Pure benzole is about 1s. 9d. per gallon, pure toluole about 1s. 10½d. per gallon, light solvent about 1s. 7d. per gallon, at works. Other products are without change.

Tar Products in the Provinces.

June 10.

The market for tar products has remained very quiet throughout the past week. There is no alteration in the prices, and very little business is reported as having been done.

The average values for gas-works products during last week were: Gas-works coal tar, 50s. to 55s. Pitch, East Coast, 59s. to 61s. 6d. f.o.b. West Coast—Manchester, 55s. to 57s. 6d.; Liverpool, 56s. to 58s.; Clyde, 57s. to 59s. Benzole 90 p.ct., North, 1s. 5d. to 1s. 6d.; crude 65 p.ct. at 120° C., 1s. to 1s. 1d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 8d. to 1s. 10d. Toluole, naked, North, 1s. 5d. to 1s. 6d., nominal. Coal tar crude naphtha in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 1s. 4d. to 1s. 5d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, liquid, 7¾d. to 7½d.; salty, 7d. to 7¼d.; Scotland, 6½d. to 7d. Heavy oils, in bulk, North, 9d. to 9½d. Carbolic acid, 60 p.ct, 2s. 1½d. to 2s. 4½d. prompt. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Partington (Manchester) Gas-Works Scheme.—The Special Unemployed Works Committee of the Manchester Corporation have reported on the scheme of the Gas Committee for work in connection with the carbonizing plant at Partington, estimated to cost £450,000, and which will employ about 300 men for eighteen months. The Committee suggest commencing the scheme at once, and explain that these works have already been approved by the Council as part of the cost of the first unit of the Partington Gas-Works scheme. When the scheme was before the Council in March, 1923, it was stated that three years would elapse before Partington would be available as a gas manufacturing station. It is now proposed to expedite the part of the work relating to carbonizing plant, in order to provide work for the unemployed; and on these grounds it is put forward as a relief scheme. In this case it is expected that the Government grant will be equal to 50 p.ct. of the interest charges for a period of fifteen years. The Finance Committee approve these proposals on condition that they are only proceeded with if included for grant purposes by the Government.

The Pontypridd Urban District Council, on the recommendation of the Engineer and Manager (Mr. David Muir), have decided to instal 500 "Metropolitan" duplex clock controllers on their public gas-lamps.

The Lytham St. Annes Council have approved the action of the Gas Sub-Committee in deciding that the appointment of a gas examiner be further considered after the supply of gas is available from the new gas-works at Eastham.

In a golfing match with the Eastern Star Lodge Golfing Society, last Friday week, Mr. A. R. Barford (of the Welsbach Light Company, Ltd.), Captain of the North Surrey Golf Club, playing on his own course, did the 13th hole in one stroke.

On Monday of last week Chiswick was plunged in darkness as the result of an electric light failure. Performances had to be suspended at kinemas, and candles had to be used at the Chiswick Empire. The darkness continued for over an hour-and-a-half.

There was recently launched by the Burntisland Shipbuilding Company, Ltd., the coal-carrying steamer "*Woodcote*," which they have built for the Wandsworth, Wimbledon, and Epsom District Gas Company. The vessel, which is 228 ft. in length, 35 ft. in breadth, 18 ft. 6 in. in depth, and of 1800 tons deadweight, will have machinery by the North Eastern Marine Engineering Company, of Wallsend on-Tyne.

Dr. W. Allen Daley, Blackburn's Medical Officer, mentions in his annual report that the increasing use of gas for heating and power is improving the unsatisfactory state of the atmosphere consequent upon the emission of black smoke. During the year, 1895 new gas-cookers, and 495 gas fires, boilers, &c., were supplied by the Corporation Gas Department; the total number of gas-cookers and heating apparatus now in use being 41,972.

The Directors of the European Gas Company, Ltd., have, subject to audit, decided to recommend the payment on Aug. 1 next of a final dividend of 6s. per share, free of income-tax, which, with the interim dividend paid on Feb. 1 last, will represent a total dividend of 4 p.ct., free of income-tax, for the year ended March 31 last. For the year 1922-23, two dividends of 5s. per share were paid, making a total for the year of 5 p.ct., free of income-tax.

Mr. T. Glanfield (the President) took the chair at the third annual dinner last Saturday week, at Exeter, of the Willey Cadet Company Football Club, and was supported, among others, by Alderman F. Templer Depree, Mr. S. Furze (Chairman of the Club), Mr. G. Boucher (Hon. Secretary), and Mr. T. O. Davis (Hon. Treasurer). Responding to the toast of "Willey's Cadets," Mr. Glanfield said that, when the Cadet Company was formed six years ago, it was with the idea of making better citizens of the members. The Directors, as well as himself, were very proud of the Company. Mr. R. Pike, a member of the team, who is leaving for Canada, was presented by Mr. Depree with a gold chain.

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STOCK MARKET REPORT.

As usual, the attractions of Epsom militated against Stock Exchange business last week. The huge distribution of Government dividends brought about a little more activity at the close of the week; but the bulk of the re investment was in gilt-edged securities. The feeling prevails, however, that prices are on the high side. The 5 p.ct. War Loan rose to 101$\frac{1}{16}$ and the 3$\frac{1}{2}$ p.ct. Conversion Loan to 78$\frac{1}{16}$. The heavy borrowing by Australia has had an adverse effect on the Colonial Government securities.

The Home Railway Market was depressed generally, and Underground Electric shares declined to 2$\frac{1}{2}$ for the £10 shares, due doubtless to the unofficial strike of the shopmen. Oil shares were subjected to some further liquidation, the exception being Lobitos, which rose to 9$\frac{5}{8}$ on the excellent results of last year. Considerable interest will be taken in the Dunlop capital reconstruction scheme published on Saturday; and although the drastic reduction of the ordinary capital by writing down the £1 shares to 6s. 8d. will cause considerable heartburning, a superficial survey of the proposals indicates that the scheme is a masterly piece of work.

Issue.	Share.	When ex-Dividend.	Dividends. Prev. Hf.Yr.	Dividends. Last Hf. Yr.	NAME.	Quotations. June 6.	Rise + or Fall − on Week.	Transactions Lowest and Highest Prices.
£			% p.a.	% p.a.				
131,978	Stk.	Feb. 7	5	5	Aldershot 5 p.c. max. C.	79—82	+1	79—81
235,492	,,	,,	4	4	Do. 4 p.c. Pref.	70—73	+1	..
1,551,868	,,	Apr. 3	5½	6	Alliance & Dublin Ord.	63—68	−1	63—66
374,000	,,	Jan. 10	4	4	Do. 4 p.c. Deb.	60—65	..	..
280,000	5	May 22	8	8	Bombay, Ltd.	5—5½*	..	..
100,000	10	Mar. 6	8½	8½	Bournemouth 5 p.c.	12½—13½	..	..
383,110	10	,,	7	7	Do. B 7 p.c.	12—13	..	..
115,000	10	,,	6	6	Do. Pref. 6 p.c.	11—12	..	..
50,000	Stk.	Dec. 28		3	Do. 3 p.c. Deb.	55—60	..	..
162,025	,,	,,		4	Do. 4 p.c. Deb.	75—80	..	..
992,045	,,	Feb. 21		6$\frac{1}{16}$	Brentford A Con.	97—102	..	100—100½
990,500	,,	,,		6½	Do. B New	97—102	..	99½—100½
76,000	,,	,,		5	Do. 5 p.c. Pref.	89—94	..	..
306,690	,,	Dec. 13		4	Do. 4 p.c. Deb.	76—81	..	..
181,337	,,	—		—	Do. 6 p.c. Rich. Red. Deb.	100—105	..	..
214,740	,,	Mar. 6	1	11$\frac{1}{2}$	Brighton & Hove Orig.	170—175	..	..
244,200	,,	,,		8½	Do. A Ord.	124—127	..	..
1,287,500	,,	Feb. 21		5	Bristol 5 p.c. max.	92—93a	..	..
855,000	,,	Mar. 20	—	7	British Ord.	117—122	..	117½—118
100,000	,,	—	7	7	Do. 7 p.c. Pref.	120—125	..	122½
120,000	,,	Dec. 28	4	4	Do. 4 p.c. Red. Deb.	73—78	..	76
100,000	10	May 22	6	8	Cape Town, Ltd.	6½—7½*	..	7½
100,000	10	Apr. 24	4½	4½	Do. 4½ p.c. Pref.	6—7	..	6½
150,000	Stk.	Dec. 28	4½	4½	Do. 4½ p.c. Deb.	73—78	..	..
626,860	,,	Feb. 21	6	6	Cardiff Con. Ord.	97—99	..	..
237,860	,,	Dec. 28	7½	7½	Do. 7½ p.c. Red. Deb.	105—110	..	..
157,150	,,	Mar. 6	5	6½	Chester 5 p.c. Ord.	88—93b	..	..
1,513,280	,,	,,	6	6	Commercial 4 p.c. Cap.	90—95	..	91½
560,000	,,	,,	6	6	Do. 3½ p.c. Cap.	90—95	..	..
475,000	,,	Dec. 13	3	3	Do. 3 p.c. Deb.	57—60	..	..
800,000	,,	14 Jan. 15	—	—	Continental Union, Ltd.	28—33	..	28
200,000	,,	Dec. 13	7	7	Do. 7 p.c. Pref.	78—83	..	..
660,000	,,	Mar. 6	6½	6½	Croydon sliding scale	101—104	..	..
284,975	,,	,,	5	5	Do. max. div.	83—86	..	..
492,270	,,	Feb. 21	3	4½	Derby Con.	108—110c	..	..
55,000	,,	Jan. 12	4	4	Do. Deb.	74—76c	..	..
209,000	,,	Apr. 3	5	5	East Hull 5 p.c. max.	..	..	..
1,002,180	10	Jan. 24	5	2	European, Ltd.	6½—7½	+¼	6$\frac{15}{16}$—7$\frac{1}{16}$
16,503,045	Stk.	Feb. 7	5½	5½	Gas Light & Coke 4 p.c. Ord.	93½—95½	−½	93½—94½
2,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	62—65	+1	63½—64
4,062,235	,,	,,	4	4	Do. 4 p.c. Con. Pref.	80—83	..	81—82½
4,761,930	,,	Dec. 13	3	3	Do. 3 p.c. Con. Deb.	61—64	+1	62—63
130,000	,,	Dec. 11	10	10	Do. 10 p.c. Bonds	..	..	192—193
42,000	,,	—	7½	7½	Do. 7½ p.c. Ilford Deb.	..	..	..
82,500	,,	Mar. 20	6½	6½	Hastings & St. L. 5 p.c. Conv.	91—96	..	..
258,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	76—81	..	..
70,000	10	May 8	10	10	Hongkong & China, Ltd.	16—17	..	..
86,600	Stk.	Mar. 6	9½	10	Hornsey 7 p.c.	143—148	..	..
1,076,000	,,	May 22	10	30	Imperial Continental Cap.	150—155*	..	151—153½
401,400	,,	Feb. 7	3½	3½	Do. 3½ p.c. Red. Deb.	69—72	..	..
235,242	,,	Mar. 6	6½	6½	Lea Bridge 5 p.c. Ord.	95—100	..	96½—97½
2,127,340	,,	Feb 21	5½	5½	Liverpool 5 p.c. Ord.	92—93b	..	..
600,000	,,	Mar. 20	7	7	Do. 7 p.c. Red. Pref.	103—106b	..	104½—105½
165,736	,,	Feb. 21	9	8	Maidstone 5 p.c. Cap.	124—129	..	..
63,480	,,	Dec. 28	3	3	Do. 3 p.c. Deb.	54—59	..	..
75,000	5	Dec. 13	7	5	Malta & Mediterranean	3½—3½	..	..
50,000	100	Apr. 1	4½	4½	Met. of Melb'rne 4½ p.c. Deb.	..	..	..
541,920	Stk.	Nov. 29	4	4	Montevideo, Ltd.	54—59	..	..
1,875,892	,,	Mar. 6	4¾	5½	Newcastle & Gateshead Con.	85—86d	+½	..
250,166	,,	,,	4	4	Do. 4 p.c. Pref.	74—76d	+1	..
329,705	,,	Dec. 28	3½	3½	Do. 3½ p.c. Deb.	71—73d	..	..
15,000	10	Mar. 6	11	11	North Middlesex 10 p.c.	16—17	..	..
75,940	10	,,	7$\frac{7}{16}$	7$\frac{7}{16}$	Do. 7 p.c.	11½—11¾	..	..
300,000	Stk.	May 8	9	7	Oriental, Ltd.	98—101	..	..
138,120	,,	Dec. 28	7¾	7¾	Plym'th & Ston'house 5 p.c.	115—120	−2	115½—116
60,000	50	Mar. 6	13	13	Portsea Island B	102—105	..	..
100,000	50	,,	12	12	Do. C	98—103	..	..
1,450,345	5	29 Oct. 14	—	—	Primitiva Ord.	⅞—1	..	7/1½—7/9
2,499,800	5	30 Dec. 15	—	—	Do. 5 p.c. Pref.	1½—1¾	..	..
341,400	100	June 2	4	4	Do. 4 p.c. Red. Deb.	69—74*	−1	..
600,000	Stk.	Jan. 24	4	4	Do. 4 p.c. Red. Deb. 1911	54—57	..	..
220,335	,,	Dec. 28	4	4	Do. B. Aires 4 p.c. Rd. Db.	55—58	..	..
321,670	,,	,,	4	4	Do. R'r P'te 4 p.c. Rd. Db.	55—58	..	..
150,000	10	Mar. 20	6	6	San Paulo 6 p.c. Pref.	6½—7	..	..
125,000	50	Jan. 2	5	5	Do. 5 p.c. Red. Deb.	39—41	..	..
270,000	Stk.	Mar. 20	5	5/8/4	Sheffield A	100—102e	..	99¾
419,968	,,	,,	5	5/8/4	Do. B	100—102e	..	99¾
1,047,000	,,	,,	5	5/8/4	Do. C	100—101e	..	..
90,000	10	Oct. 18	9	6	South African	7—9	..	..
6,609,895	Stk.	Feb 21	5	6½	South Met. Ord.	99—101	..	99—99¾
102,580	,,	Jan. 10	5	5	Do. Red Pref.	98—100	..	..
1,895,445	,,	,,	3	3	Do. 3 p.c. Deb.	58—61	..	61
734,000	,,	Mar. 6	6½	6½	Do. 6½ p.c. Red. Deb.	103—105	..	..
91,500	,,	,,	8½	8½	South Shields Con.	136—138d	..	..
1,087,795	,,	Feb. 21	6	6½	South Suburban Ord. 5 p.c.	100—105	..	102—103
368,837	,,	Dec. 28	5	5	Do. 5 p.c. Deb.	95—100	..	98—99½
647,740	,,	May 8	6	5	South'mpt'n Ord. 5 p.c. max.	84—87	..	..
121,275	,,	Dec. 28	4	4	Do. 4 p.c. Deb.	74—79	..	77½—77¾
250,000	,,	Mar. 6	7	7	Swansea 7 p.c. Red. Pref.	103—105	+1	104—104½
200,000	,,	Dec. 28	6½	6½	Do. 6½ p.c. Red. Deb.	102—104	..	..
120,000	,,	Feb. 21	8	8	Tottenham District A 5 p.c.	119—124	..	..
582,270	,,	,,	6½	6½	Do. B 3½ p.c.	100—103	..	101½—102
181,255	,,	Dec. 13	4	4	Do. 4 p.c. Deb.	77—81	..	..
258,251	,,	Mar. 20	5	7/14/4	Tynemouth Con. and New Wandsworth, Wimbledon, and Epsom—	87—89d	..	..
30,000	,,	Mar. 6	9	9½	Wandsworth A 5 p.c.	132—137	..	..
255,636	,,	,,	7½	7½	Do. B 3½ p.c.	110—115	..	..
108,075	,,	,,	6$\frac{3}{16}$	6/7/9	Do. C	96—101	..	..
240,865	,,	,,	6$\frac{3}{16}$	6/7/9	New Ordinary	..	..	..
352,000	,,	,,	7⅜	7⅜	Wimbledon 5 p.c.	108—113	..	..
98,000	,,	,,	7⅜	7⅜	Epsom 5 p.c.	113—120	..	..
88,426	,,	Dec. 28	3	3	3 p.c. Deb.	56—61	..	..

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. * Ex. div.

The prices of the Lever Bros. 7 p.ct. and 8 p.ct. preference shares have been gradually dropping since the new issue announcement, and business was done on Friday at 20s. 7½d. in both classes of shares; the renunciation letters being dealt in on a basis of 2d. to 3d. per share only.

There were variable fluctuations in the quotations of Gas securities; the balance having an upward tendency. In spite of the lower dividend of 4 p.ct. for the year declared by the European Company, as compared with 5 p.ct. for the previous year, the ordinary stock rose ½.

The following transactions were recorded during the week:

On Monday, Aldershot "C" 79, Brentford "A" 100, European 6$\frac{18}{32}$, Gas Light and Coke 94, 94$\frac{1}{8}$, 94$\frac{3}{8}$, 94$\frac{1}{2}$, 94$\frac{5}{8}$, 4 p.ct. preference 81, 3 p.ct. debenture 62½, 62$\frac{5}{8}$, Imperial Continental 151, 151$\frac{3}{4}$, 152 *ex* div., Liverpool 7 p.ct. preference 105½, South Metropolitan 99½, 3 p.ct. debenture 61, Tottenham "B" 101½. Supplementary prices, Tuscan 6 p.ct. debenture 75.

On Tuesday, Alliance and Dublin 66, Gas Light and Coke 94, 94$\frac{1}{8}$, 94$\frac{3}{8}$, 94$\frac{3}{4}$, 3½ p ct maximum 63¼, 4 p ct. preference 81, 81¾, 3 p.ct. debenture 62½, 63, Imperial Continental 151, 151½, 152 152$\frac{3}{8}$, 153½ *ex* div., Lea Bridge 96½, Liverpool 7 p.ct. preference 104½, Plymouth and Stonehouse 115¼, 116, Sheffield "A" 99$\frac{7}{8}$, "B" 99$\frac{7}{8}$, South Suburban 5 p.ct. 103, Southampton 4 p.ct. debenture 77¼, 77$\frac{3}{4}$, Swansea 7 p.ct. preference 104. Supplementary prices, Aldershot new "C" 80½, Gas Light 10 p.ct. bonds 192, Grays and Tilbury "B" 7$\frac{3}{8}$, Kingston-upon-Thames 108½, 109, Southend-on-Sea 5 p.ct. new "B" 87, Southgate and District 7 p.ct. maximum 103, 5 p.ct. preference 92.

On Wednesday, Aldershot "C" 80¼, 80$\frac{3}{4}$, Alliance and Dublin 63, 66, Bahia-Blanca ordinary "A" 4s., British 4 p.ct. debenture 76, Cape Town 4½ p.ct. cum. preference 6½, European 6$\frac{11}{16}$, Gas Light and Coke 93¾, 93$\frac{7}{8}$, 93$\frac{3}{4}$, 94, 94¼, 94$\frac{3}{8}$, 3½ p.ct. maximum 63¼, 63$\frac{3}{4}$, 4 p.ct. preference 81, 82, 82½, 3 p.ct. debenture 62, 63, Imperial Continental 151, 151½, 152, 152½ *ex* div., Lea Bridge 97½, South Metropolitan 99$\frac{3}{4}$, South Suburban 5 p.ct. 102½, 5 p.ct. debenture 98, 99$\frac{3}{4}$, Swansea 7 p.ct. preference 104½, Tottenham "B" 102, Tuscan 6 p.ct debenture 72. Supplementary prices, Aldershot new "C" 5 p.ct. maximum 80½, 80$\frac{3}{4}$, British (Norwich) 4 p.ct. debentures, 76, Gas Light 10 p.ct. bonds 193, Romford 4½ p.ct. debentures 85½, Southgate 7 p.ct. maximum 104.

On Thursday, Aldershot "C" 81, Brentford "A" 100½, "B" 99½, 100, British 118, Continental Union 28, European 7, Gas Light and Coke 93$\frac{3}{8}$, 93$\frac{7}{8}$ 94$\frac{1}{4}$, 94½, 3½ p.ct. maximum 63½, 64 4 p.ct. preference 81, 3 p.ct. debenture 62½, Imperial Continental 151½, 152½, 152$\frac{3}{8}$, 153¼ *ex* div., Primitiva 7s. 1½d., South Metropolitan 99, 99½, Tuscan 6 p.ct. debenture 72, 72½. Supplementary prices, Aldershot new "C" 80¼, 80$\frac{3}{4}$, Gas Light and Coke 10 p.ct. bonds 192.

On Friday, Aldershot "C" 81, Brentford "B" 99½, 100½, British 117½, 7 p.ct. preference 122½, Cape Town 7¼ *ex* div., 4½ p.ct. preference 6½, Commercial 4 p.ct. 91½, Continental Union 28, European 7, 7$\frac{3}{16}$, 7$\frac{5}{16}$, Gas Light and Coke 93½, 94, 94¼, 3½ p.ct. maximum 64, 3 p.ct. debenture 62½, Imperial Continental 151½, 152, 153 *ex* div., Primitiva 7s. 9d., South Metropolitan 99½, 99¾, 99$\frac{7}{8}$, South Suburban 5 p.ct. 102. Supplementary prices, Aldershot "C" (5 p ct. maximum) 80$\frac{3}{4}$, 81.

Money was plentiful in Lombard Street during the week, as a result of the Government disbursements. On Friday morning, loans for the night were freely offered at 1½ p.ct., and in the afternoon the rate dropped to 1 p.ct., and lenders were left with balances on their hands. As a consequence the demand for bills tended to increase. There was a further drop in the average rate for Treasury Bills, which were allotted at £2 18s. 3·52d. p.ct.

In the Foreign Exchange Market the French Exchange continued in a very uncertain manner, but improved during the week. After touching 89.20 on Monday, it fluctuated between 83.30 and 87.35, closing at 85.95. Belgian francs closed at 98$\frac{5}{8}$. The final quotation of sterling on New York was 4.31, after touching 4.32½ on Wednesday. Dutch florins moved against us and closed at 11.51$\frac{5}{8}$.

Silver continued a firm market, the cash price being 35$\frac{5}{8}$d. per oz. at the close.

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Applications, endorsed "Coke Salesman," from persons having an intimate knowledge of the Coke Trade, stating Age, Qualifications, and Experience, together with *copies* of not more than Three recent Testimonials, should be delivered to the undersigned not later than June 19, 1924.

H. C. SMITH,
Chief Engineer.

689, High Road,
Tottenham, N. 17,
May 29, 1924.

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Apply, stating Age, Qualifications, and Experience, also Wages required, together with *copies* of Three Testimonials, to No. 7431, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.

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Apply, giving full Particulars of Experience, Age, and stating salary required, to No. 7430, "GAS JOURNAL," 11, BOLT COURT, FLEET STREET, E.C. 4.